The Builder.

VOL. LXX. NO. 2768. FEBRUARY 2, 1896.

ILLUSTRATIONS.

Park Elevation of the Horse Guards.—Measured and drawn by Mr. A. Haswell Christie.....*Extra Large Page Photo-Litho.*
Palace of the Prussian Diet, Berlin.—Herr Friederich Schulze, Architect.....*Double-Page Photo-Litho.*
Design for a Suburban House.—By Mr. Ambrose M. Poynter.....*Double-Page Ink-Photo.*
"Romanesque Architecture": Illustrations to Professor Aitchison's Third Royal Academy Lecture.....*Double-Page Photo-Litho.*

Blocks in Text.

Plan, Cross-section, and End Elevation of Mr. Oldfield's proposed Restoration of the Mausoleum at Halicarnassus.....Page 154
Grille, Wynward Park near Stockton.—Drawn by Mr. Jas. A. Lofthouse.. „ 160
Plan of Galleries to Council Chamber, The Prussian Diet, Berlin.....Page 164
Details, The Horse Guards, Whitehall.....„ 165
Illustrations to Student's Column.....„ 169

CONTENTS.

A New Restoration of the Mausoleum..... 153
Competition, Royal Insurance Buildings, Liverpool..... 155
Notes..... 156
Romanesque Architecture..... 158
Wrought Iron Grille, Wynyard Park..... 160
The Royal Institute of British Architects..... 160
The Conditions of Building Contracts..... 161
Lectures on Sculpture at the Royal Academy..... 162
The Stability of Tall Chimneys..... 162
The London County Council..... 163
The Horse Guards..... 164
The Prussian Diet, Berlin..... 164
Design for Suburban House..... 165
Competitions..... 166
Architectural Societies..... 166
Engineering Societies..... 165
Co-efficients for Iron-beams..... 167
Sea-water for Watering Roads..... 167
Association of Municipal and Sanitary Engineers..... 167
War Department Contracts..... 167
The Student's Column: Carpentry and Joinery.—VII..... 168
Applications under the London Building Act, 1894..... 170
Obituary..... 170
General Building News..... 170
Sanitary and Engineering News..... 171
Foreign..... 172
Miscellaneous..... 172
Legal..... 173
Meetings..... 173
Recent Patents..... 173
Some Recent Sales of Property..... 174
Prices Current of Materials..... 175
Tenders..... 175

A New Restoration of the Mausoleum.

ON Monday last Mr. Oldfield brought before the Hellenic Society, in an exceedingly acute and closely-reasoned paper, his view as to the design and construction of the Mausoleum at Halicarnassus, which he had already embodied in a much fuller communication to the Society of Antiquaries. This latter has been issued as a separate publication,* illustrated by reproductions from elaborate drawings of Mr. Oldfield's proposed restoration, and also by representations of the previous restorations of Cockerell, Fergusson, and Pullan.

Although all such restorations must be more or less conjectural, any step towards a more correct appreciation of the actual design and construction of this world-renowned monument is of interest, more especially when we now have so much of the actual remnants of it at our doors in the gallery of the British Museum. And Mr. Oldfield's attempt has this special interest about it, that he has gone to work on a more logical system than most of his predecessors. He has commenced by an unbiassed consideration of the literary references to the mausoleum, endeavouring to realise what they actually meant, and to frame from them conditions, in the first place, to which any restoration of the monument must conform. And in this process he has brought into prominence one or two points the significance of which has certainly been overlooked.

Mr. Oldfield's first point, and perhaps the most important, is the stress which he lays on the word "pendentia" in the passage from Martial:—

> "Aere nec vacuo pendentia mausolea
> Laudibus immodicis Cares in astra ferant."

He argues that Martial did not use such an expression as "hanging in empty air" without meaning something special by it, and that what his meaning was is rendered pretty clear by another quotation, in the second book of epigrams, referring to Selius—

> "Inde petit centum pendentia tecta columnis
> Illinc Pompeii dona, nemusque duplex":

whence it appears that roofs supported on columns were, in Martial's phrase, "pendentia," "hanging"; which could only mean that they stood on no solid continuous support, only on columns with spaces between. Hence we should gather that a peculiarity of the Mausoleum was that the upper portion appeared to show a great mass carried on unusually open supports, and that it was part of the glory of the Carians that their great show structure was what in those days was considered a *tour de force* of construction, a massive superstructure with apparently inadequate columnar supports. Some light is thrown on the manner in which such matters were regarded in the antique world by the remark of one of the writers on the church of St. Sophia, some centuries later, who marvelled at the boldness of the man who dared erect, in the upper galleries, great columns "standing over empty air;" the columns of the upper order not being over those of the lower, but over the inter-spaces. This remark illustrates the persistance of the ancient idea that any large superstructure ought to have something solid immediately under it; and if this idea still prevailed in the sixth century A.D., after the arch had come into general use, much more might we expect to find it prevalent at a time and in a country where architecture, so far as spaces were to be bridged, was entirely trabeated and columnar. The Greeks were accustomed to exterior colonnades supporting the margins of a roof the centre of which was carried by the cella walls; there must have been something more than this to call forth special remarks in admiration of the structure of the Mausoleum. We know that it had a pyramidal roof, which would be a very weighty construction, and this must have been constructed so as to cause some surprise at the apparent lightness of its supports, in order to justify Martial's reference to it as "aere vacuo pendentia"—"hanging in empty air."

We must quite agree with Mr. Oldfield that such a consideration entirely disposes of Pullan's restoration, the upper stage of which shows a single peripteral colonnade with a solid wall, occupying the usual position of the cella wall, only 7 ft. behind it, so that there was nothing in the apparent construction but what might be seen in any peripteral temple. It stands high in the air, on a very lofty podium, and it might be urged that "aere vacuo pendentia" referred to this lofty position of the colonnaded portion of the structure, but this would not explain Martial's use of "pendentia tecta" in the second passage quoted above. Fergusson's restoration, in which the colonnaded portion is much deeper, in other words, the solid wall much farther in the rear of the outer row of columns, approaches more nearly to the required ideal in this sense, and Fergusson attempted also to carry the expression of lightness further by introducing open colonnades (of, we must say, very clumsy design) in the ground story. Fergusson's design is, however, so ungraceful and so entirely un-Greek in conception, that we may dismiss it with the criticism that, whatever the Mausoleum was like, it certainly was not like that. Pullan's has the merit of simplicity and harmony of design and proportion; but it does not accord with the impression conveyed by literary reference to the Mausoleum.

All the previous restorers have supposed the Mausoleum to have been a plain parallelogram on plan. The difficulty however is that Pliny states that the monument was 63 ft. on the north and south sides, and "brevius a frontibus"—shorter on the fronts, meaning of course the two remaining sides; but that its entire circuit was 411 ft., which of course is entirely at variance with the measurements given to the longer sides, if we supposed it to be a plain parallelogram. Mr. Oldfield's explanation is that the structure had four principal façades projected from the centre block of the plan (see his plan on next page), and that Pliny's sixty-three feet referred to the width of the side projections, just as we might give the width across the transepts of St. Paul's without by any means intending to imply that this was the complete length of its side elevation. He supports this view further by the observation that Pliny, having given the width of the north and south sides, refers to the other two sides not as "the east and west sides," but under the title "the fronts;" thereby implying that these were especially marked out as the main fronts by something

* The Mausoleum at Halicarnassus; a new Restoration. Communicated to the Society of Antiquaries by Edmund Oldfield, M.A., F.S.A. Westminster: Nichols and Sons; 1895.

in the architectural treatment. That something, we fully admit, could hardly be anything else than a pediment, the recognised defining feature of the front of a Greek building. The argument is at least ingenious, and certainly we cannot very well imagine Pliny speaking of these two sides (or ends) as "frontes" unless there were something in the treatment of them to suggest the word.

The most important of Mr. Oldfield's suggestions refers to the introduction of the spreading flight of steps at the base of the monument (see drawings), and the manner in which the platform is formed for the quadriga at the apex. These two details, though far apart on the design, depend together upon the reading of a particular sentence in Pliny, coupled with the account given by Guichard in 1581 of the observations of de la Tourette, the Rhodian knight, in 1522. The sentence from Pliny's description, to which reference is made, is the following. After naming the four sculptors, he proceeds :—

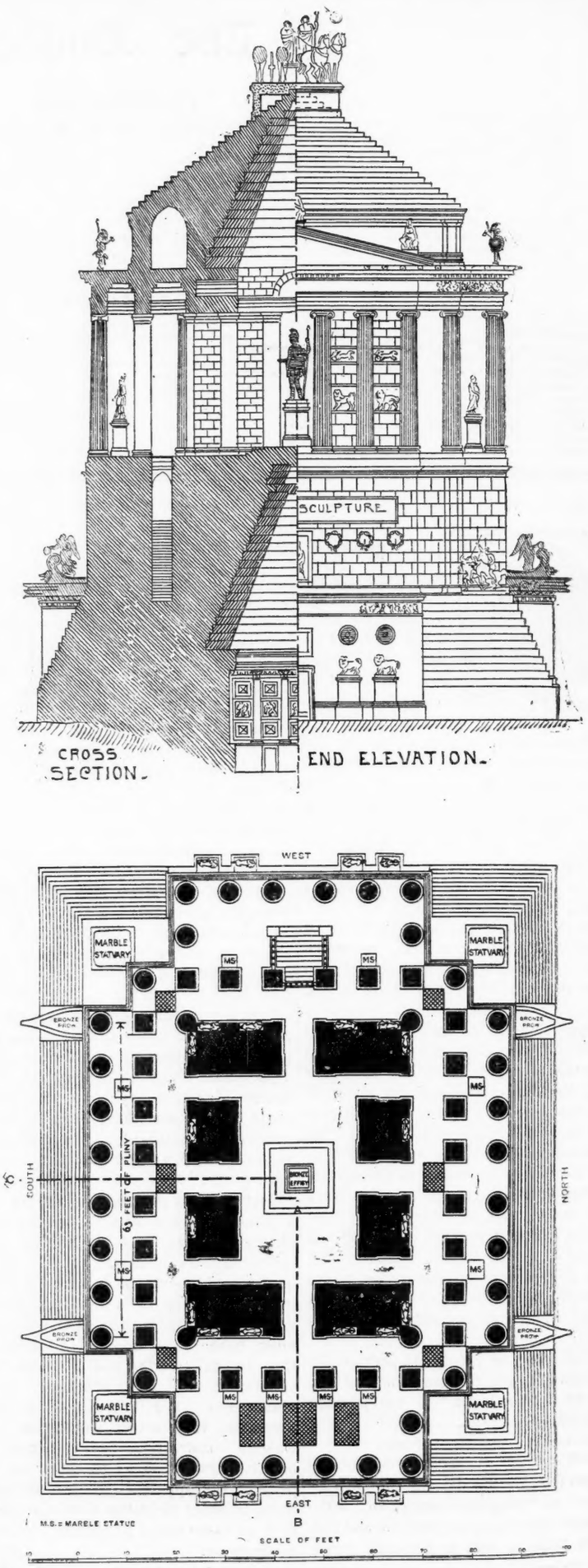
"Accessit et quintus artifex. Namque supra Pteron pyramis altitudine inferiorem æquavit, viginti quatuor gradibus in metæ cacumen se contrahens. In summa est quadriga marniorea quam fecit Pythis. Hæc adjecta centum quadraginta pedum altitudine totum opus includit."

The special point in the foregoing sentence, in Mr. Oldfield's argument, is Pliny's use of the past tense in "æquavit." "The pyramid *was* equal to the lower one in height." In all the rest of the description of the structure Pliny uses the present tense, and some copies read the present here also—"æquat," "is equal to." Mr. Oldfield's reason for preferring "æquavit" is perfectly logical. If Pliny had originally written "æquat," no commentator or transcriber would have been likely to expand this into "æquavit." But if "æquavit" had been originally written, it might very well have been shortened into "æquat," either through a mistake from abbreviated writing, or from a conviction that as Pliny used the present tense in all the rest of his description, his use of the past tense in this one word must be an error. Mr. Oldfield therefore adopts "æquavit," and the point of this may be best expressed by giving a free translation of the meaning of the passage as he reads it :—

"[But] a fifth artist also came upon the work. For above the Pteron the pyramid was [formerly] equal in height to the lower [pyramid], of four and twenty steps contracting itself to [the diameter of] the apex of a meta. At the top is [now] the marble quadriga which Pythis [the fifth artist] made. With this addition the total height of the work is one hundred and forty feet.'

That is to say, the fifth artist, Pythis, altered the pyramid, which was formerly "equal in height to the lower pyramid," and placed a marble quadriga on the top. Mr. Oldfield's reading of this is indicated in the section of his restoration. The pyramid had formerly contracted itself at the top to a narrow point like the termination of a *meta* or goal. Upon such a point a quadriga group could not be placed. But Pythis built a pedestal for the quadriga over the point of the pyramid (see the dotted portion at the upper part of the section), thereby adding to the total height of the monument, and making up the 140 feet, but at the same time lowering the apparent height of the pyramid of steps (by hiding the three or four upper ones), and thus making it no longer equal in height to the lower pyramid ("inferiorem"). But what was the lower pyramid?

Here we come to the most important novelty in the restoration, and to the connexion of Guichard's account with the argument. For Guichard's statement is that the military party from Rhodes, being required to build or strengthen the fortifications at Halicarnassus against an expected attack of the Turks, looked about for stone for the purpose, and caught sight of "certaines marches de marbre blanc, qui s'eslevoyent en forme de perron"; certain steps of white marble appearing above the surface of the ground. "Perron" in this passage has by some been taken to mean a terrace, but it seems much more reasonable



Plan, cross section, and end elevation, of Mr. Oldfield's proposed restoration of the Mausoleum at Halicarnassus.

to take it in its ordinary meaning of an exterior flight of steps. Having removed all the material of these steps which was visible above the ground, they proceeded to excavate for more, and found that "de tant plus qu'on creusoit profond, d'autant plus s'élargissoit par le bas le fabrique": the lower they dug, the farther outward they found the masonry spreading. They took it all away to use the material in their fortifications, but their account remains, and it certainly exactly tallies with the idea of a spreading external stair round the base of the monument, as represented in Mr. Oldfield's restoration, and thus supplies an explanation of Pliny's reference to some "lower pyramid" to which the pyramid on the roof had been equal in height, until Pythis reduced the apparent height of the latter to form the pedestal for his quadriga.

This is really a masterpiece of acute reasoning on Mr. Oldfield's part, and suggests a consensus between two accounts, that of Pliny and that of the sixteenth-century despoilers of the monument, which appears never to have been observed before. There is nothing inherently improbable in the external flight of steps or gradines at the base of the monument, and the assumption of its existence harmonises both accounts.

Two objections may be raised to the argument considered as a whole. In the first place, referring to Martial's mention of the Mausoleum, it may be said that "aere vacuo pendentia" might refer to the fact that the ordinary design of a peristylar building, usually seen on the ground level, was here seen erected on a lofty basement elevating it into the air; just as Michelangelo said that his dome of St. Peter's should be the Pantheon raised into the air. But the second passage from Martial in which the word "pendentia" occurs seems against this view—seems to imply something special in the construction itself. Then, in regard to Mr. Oldfield's assumption that anything "contracting itself into a point like a *meta*" could not possibly afford a platform for a quadriga group, it might be answered that this may be only a loose description, and that, at a distance especially, the pyramidal roof, even with the platform or truncated top, might seem to grow to a point sufficiently to suggest the resemblance to a *meta*. But though these are possible objections, we are much inclined to accept Mr. Oldfield's explanation of these points. The words of Pliny certainly seem to suggest the idea that Pythis was an artist who came on the work after the others had done their part, and who made some alteration of his own in it.

Whether we can accept Mr. Oldfield's restoration, as a whole, as a probable one, is another matter. We accept his lower flight of gradines as all but proved. The explanation of the manner in which the pedestal for the quadriga was formed, over the meta-like apex, is quite possible, and is not discordant with any literary reference to the monument. But the whole design is deficient in simplicity. The projection on each face of the plan savours more of Roman than Greek feeling in architecture. It provides a possible means of reconciling Pliny's measurement of the side elevations with his measurement of the circumference of the structure; but for all that we are disposed to believe that the actual building was a simple parallelogram, and that the discrepancy in the measurements must be explained in some other manner; that possibly Pliny's all-round measurement referred to the extreme limit of some additional feature surrounding the base of the structure. Mr. Oldfield has brought forward in his treatise, and he also exhibited at the Hellenic Society, drawings of four examples of antique structures which might be supposed to have been formed upon or to represent the architectural idea of the Mausoleum—viz.: the tomb at Mylassa (given in Vol. I. page 353 of Fergusson), a monument at Souma in Algeria, a monument at Ooran in Phrygia, and a monument at Celenderis in Cilicia. We may draw his attention to the fact that all these are simple parallelograms (on plan), without any indication of a treatment in projecting bays. Then again the very large piers behind the columns in the upper story, and the method of roofing above them, seem out of keeping with probability. If these were built as shown on the plan and section, it would be found that the space within the piers would be very dark and cavernous—no place to put a statue to be a conspicuous object; nor would they admit of the monument being seen through except in a straight line with the openings. Such masses of masonry would detract very much from the idea of the "pendentia tecta"; they would fill up the interior too much. Then the form of roofing adopted, which might do very well in the partially underground chamber, seems very much at variance with Greek architectural habits, as employed here in the upper portion of the structure. Cockerell's restoration, with an open colonnade occupying the greater part of the platform, and a very small cella in the centre nearly hidden among the columns, seems much more like the probabilities of the design, as far as general character goes. We should have imagined this with walls, with hollow spaces between them, built up over the architraves, to support the pyramidal steps, and showing a coffered ceiling from below. The objection urged to this is that the actually discovered steps, some of which are now in the British Museum, necessitated a greater spread of base than these thirty-six columns could have carried, even with the assistance of the walls of the small central cella; and it must be remembered that Pliny limits us to "thirty-six" columns. That is a difficulty; there are difficulties in each view; but nevertheless that idea of Cockerell's comes nearer to Martial's "pendentia" and to our general notions of Greek architecture than any other. We have only a few of the steps; is it possible that we are wrong in our estimate of the total width they would give for the pyramid, or that their width may have been diminished as they ascended?

Nevertheless, Mr. Oldfield has shown great acuteness of criticism and interpretation, has brought forward some important new ideas, and has certainly advanced the subject a stage.

He made a passing reference to Hyginus, one of the ancient authors who refers to the Mausoleum, and who is generally discredited, partly as being a very inferior writer, and partly as having given the total height of the Mausoleum as 80 ft., in opposition to Pliny's 140 ft. We are disposed to stand by Pliny, both because he was a generally careful writer, and because a height of 80 ft. does not seem sufficient to have rendered the Mausoleum the world-wide wonder which it was considered to be. We understand, however, that a well-known architect intends to champion Hyginus, and to produce to the Society of Antiquaries a restoration based on his statements: so that we have not yet done with Mausoleum restorations.

COMPETITION, ROYAL INSURANCE BUILDINGS, LIVERPOOL.

THE directors of the "Royal," one of the most successful of modern insurance companies, and having its headquarters in Liverpool, have for some time past been exercised as to the enlargement of their head offices in North John-street, at the corner of Dale-street, one of the leading thoroughfares in Liverpool. Early last year they invited plans, with a fee attached to the invitation, for the reconstruction of their offices, from five local architects, Messrs. Culshaw, Doyle, F. Holme, W. A. Thomas, and Woolfall & Eccles. These gentlemen sent their plans, and none of them were accepted. It was subsequently determined to invite the same gentlemen again to compete, but with instructions to lengthen the North John-street frontage by taking in some adjacent warehouses. Mr. Culshaw retired, but in his place were added three London practitioners, Messrs. Belcher, Collcutt, and Mountford. Some of the leading local architects were rather unaccountably neglected.

The result of the competition was announced in our last issue, ending in the success of one of the local men. It may be said, in justice to the strangers, that the local men had the advantage, at least as regards their ultimate planning, that they had been twice through the ordeal. Nevetheless some of the London plans were very excellent examples of clever, and, in some instances, original treatment of commercial arrangements.

The site to be dealt with has a southerly frontage to North John-street of about 210 ft., and on the east to Dale-street of some 50 ft. The north side of the property is bounded by a narrow (Prince's) street, not more than sixteen feet across to some high buildings. The narrow street returns to North John-street at the westerly end of the property. As will be seen, therefore, the land to be dealt with is a long parallelogram. The seven sets of drawings have been well exhibited in a large board-room, and we may offer some brief comments on them.

Set No. 1, Messrs. Woolfall & Eccles. The main points which have appealed to the directors in this competition have been the compact distribution of the departments connected with a Fire and Life Insurance office, and there are many points in the ground floor of this set which are good. The circular entrance-hall is entered from North John-street, leaving on the left just enough room for the manager's department, while on the right a central passage, allowing public inquiry at the various counters, leads to departments grouped in one large office. Opposite the entrance is the staircase, where the design fails through want of ease and space. It leads up to the board-room and other offices. In this, as in most of the designs, offices to let to the public are, at the end furthest from Dale-street, incorporated in the general design. There has been too much effort spent on the design of the elevations. A feeling of unrest contrasts unfavourably with the next elevations of Set No. 2. The ground floor and base of the building lack solidity. There are two well-drawn perspectives, but the effect of the exterior is exaggerated.

Set No. 2, Mr. E. W. Mountford. This design has won the second premium, and very nearly gained the first; at one time it nearly hung in the balance of the deciding powers. But, on referring to the ground-plan, there will be found one or two points which, unfortunately for the author, weigh adversely. The manager's department is towards Dale-street. Then comes the main entrance, and on its right the large main office, with the deep space for the public intervening between the clerks' desks and the best light of the building, viz., the windows of the wide North John-street. The access to the public space from the entrance is somewhat awkward. A good staircase leads to a fine board-room. There is much dignity and proportion about the elevations. The ground floor, with its bands of sculpture between its window-heads, is the feature of the design. The entrance doorway is very good. The perspective illustrations are also excellent, and one tinted bay of the front is the only large-scale drawing in the exhibition.

We here take the drawings out of their numerical order, because Set No. 4, we presume for the purposes of judging, is the next hung. The author, Mr. J. F. Doyle, by taking his passage centrally, allows the office desks to receive their light from the street windows. It would be an improvement if the managerial department were on the Dale-street side, away from the general office. A rather poor staircase leads up to the board-room—a fine room, well placed overlooking Dale-street. The design is illustrated by an excellent perspective tinted in Indian ink. The execution is quite remark-

able, and has brought out in a pleasant manner the exterior of the building. There is a curious resemblance between the designs of Nos. 2 and 4 as they are seen side by side. This may be due to the memories of Mr. Norman Shaw's building in Scotland Yard. In Set No. 4 there are some very strong reminders. The design differs from Mr. Mountford's in the general grouping by the introduction of a tower over the entrance. This not only emphasises the entrance as seen from Dale-street, but in the general elevation cleverly helps to separate the high windows of the board-room, &c., from the lines of those of the general elevation. Altogether, notwithstanding that the building looks crowded, is too high, and here and there displays (note, for instance, the unmeaning little bay window over front door) commonplaces, the design is cleverly conceived, and impresses the spectator with an appreciation of its fitness and power.

Set No. 3, Mr. T. E. Collcutt. This differs from those previously described by having its entrance direct from Dale-street, presumably with the idea of entering from the principal street. Mr. Belcher also has been impressed with the same idea, but although both authors, each in their own way, have dealt with it with much skill, still the long length of the side elevations has obliged them to break up its monotony with forced effects. Mr. Collcutt arranges his rooms with his accustomed skill, the general office being a good example of this — lofty, well-lighted from the sides, and likewise from the top, by recesses stretching along its length in North John-street and the narrow back street, where, obviously, the recessing is of greater value to increase the reception of light to the principal room. This room looks better in the sections than in the view, where the author's favourite arches appear too low down and too numerous, leaving the impression that dark corners may follow them. The exterior view is finely and clearly drawn almost in outline, and if the design displays Mr. Collcutt's hand unmistakably, there is the sense of satisfaction in examining it, that we do not find here and there any attachments from some popular modern work.

With this set we couple Set No. 7 by Mr. John Belcher, as these two designs start on the same basis of plan. We now proceed to describe perhaps the most interesting in the room. As was noticed above, the entrance is from the Dale-street end of the block. From it, leaving the directors' staircase to first floor, board-room on the left, and manager on the right, we enter a splendid chamber for the housing of the various commercial departments, divided into compartments by coupled columns, supporting arches groined in the ceiling. Each compartment, besides receiving light from the street windows, is crowned at the top of the groining with a glass dome some 56 ft. above the floor level. The boldness of cutting through so many floors makes the commercial mind begin to remember that floor space brings in rent, especially on land worth 50*l.* to 60*l.* per square yard. The adoption of this fine room must sacrifice many points, and cause inadequate make-shifts in the plan. The offices to let, instead of being at the west of the building, are relegated to the basement, and some appear to be under ground altogether. The views of interior and exterior are richly and powerfully tinted in indian-ink; the extent of the large room is admirably indicated. This design is remarkable as a specimen of what an architect can do when called upon to guide a great and rich company in making a permanent and central bureau of an undertaking with branches all over the world. Here he has sacrificed some income to be gained for the sake of a more perfect building, free in its peaceful effect from the character of getting the "most for the money." It is a pity that such a study, even if not adopted, should go without recognition from the company.

Set No. 5, Mr. F. Holme, presents a plan well thought out on the same lines as the successful plans. There is a great amount of detail introduced in the depicting of lifts, and clever ways of saving time in intercommunication. This design is handicapped by an exterior view which does not do justice to it, particularly in a competition where perspective drawing has arrived at such perfection. The drawing seems to have suffered from haste and consequent want of finish.

Set No. 6, Mr. W. A. Thomas. Many points in these plans are excellent, but keeping the office desks in the large commercial room away from the windows and putting the passage by them is not acceptable. The design is composed of two ends and a centre pavilion, but is injured, like No. 5, by the perspective (which, by the way, is tinted very boldly); the fault in this case being that the long side of the building is taken so acutely that its detail is completely lost.

In closing our short review we may refer to the reports that have been in the air with reference to the termination of this competition. From inquiries we have made we have strong reason to believe that the directors first made their decision unknown to the assessor, and that then he gave his award independently for the same design—Set No. 4; and no one was more astonished when the envelope was opened to know that the winner was not a London architect. During the judging Mr. Norman Shaw must have felt the oddity of his position in being asked to decide the merits of a design in the salient features of which he could not help recognising his own hand.

NOTES.

THE paper by Mr. Spiers on St. Front, Périgueux, read at the Institute of Architects on Monday, is one of the most valuable papers read there for some time, and should be carefully studied in its full form in the Institute "Transactions." One of the most interesting points touched upon in it is the curious manner of setting out the pendentives of the domes from the intrados instead of the extrados of the arch. No account of St. Front that we have hitherto come across brings out this point. The effect of the pointed arch in this case, in twisting the centre section of the pendentive, is we imagine rather exaggerated in the construction by the difficulty the builders found in the construction of the arch, with the voussoirs, at starting from the impost, cut to fit the horizontal curve of the pendentive. As the arch rose, it was difficult to alter the projection of the voussoirs to the theoretically correct line, and the result was a bulge in the upper portion of the pendentive. We had the curiosity to set out the centre vertical section of the pendentive to ½-in. scale, ignoring the voussoirs and treating it only as a homogeneous surface, and in this manner the backward curve of the upper line of the pendentive is only just perceptible on the ½-in. scale, while in the small section given in Mr. Spiers's paper the return curve is far more perceptible. Consequently we take it that the construction was not theoretically correct, but managed as well as the builders could do it by a rough method of adjustment. The account given in the paper of the manner in which St. Front has been treated by the French restoring architect, who has made important modifications in rebuilding the vaults in order to improve the design, thus entirely destroying its historical value, is a terrible example of the lengths to which "restoration" is carried in France. Some protest ought to be made against this system: ancient buildings are the property of the whole world, in one sense, and the French are ruining some of them under their drastic system of restoration.

M. PAUL DUBOIS, the eminent French sculptor, has been elected an honorary member of the Royal Academy. M. Dubois was born at Nogent-sur-Seine in 1829, and was a pupil of Toussaint and of the Ecole des Beaux-Arts. He obtained the "Médaille d'Honneur" in the Salon of 1865, and the cross of the Legion of Honour in 1867, and was created "Officier" of the Legion of Honour in 1874, "Commandeur" in 1886, and "Grand Officier" in 1889. He has been a member of the Institut since 1876. Among the best of his numerous works may be mentioned "Narcisse au Bain" (marble statue), the Infant St. John, a bronze (now in the Luxembourg), "Chanteur Florentin du XV. siècle" (bronze), and the bronze bust of Baudry at the Institut. He has also produced very fine equestrian statues of Connétable Montmorency and of Joan of Arc, and designed the fine monument to General Moricière in the Cathedral at Nantes. He is at present Director of the Ecole Nationale des Beaux-Arts. In addition to his gifts as a sculptor, M. Dubois has also displayed exceptional abilities as a painter.

THE "Inaugural Dissertation" of Dr. D. Joseph, of Heidelberg, is a piece of very useful work. It deals with the "Palaces of the Homeric Poems," and is the best critical statement we know of the present state of opinion on this complicated question. Too often these inaugural dissertations, the nearest equivalent to which are our fellowship treatises, are marked by an almost desperate struggle after originality at any price, but Dr. Joseph clearly sets before himself, not personal notoriety, but the advancement of learning. Moreover, his book is well and clearly arranged. The treatise is preceded by a good bibliography of the subject, and then falls into thirty-seven short sections on the various elements of the Homeric Palace, the *ἐρκίον πρόθυρον*, the meaning of disputed terms, such as *δουροδόκη ῥῶγες*, &c., and more general questions, such as lighting, the shape of the Homeric roof, and the like. Throughout, the treatise is remarkable for the complete absence of fanciful conjecture, and in this forms a much needed corrective to the elaborate imaginary reconstructions too frequent in the work of Perrot and Chipiez. In England the study of Homeric antiquities has been based largely on the text of Homer, and literary evidence generally, and reference to the results of excavations is too often at second-hand. Dr. Joseph maintains a just balance between the two sources—literary and monumental.

UNDER the title "Epidaure" appears an important French work on the sanctuary of Asclepius at Epidaurus as known to us through the recent excavations. The book aims at being a somewhat more popular *résumé* of results than the official publication that has already in part appeared under the direction of Mr. Kabbadias. It is fully illustrated with thirteen plates and seventy-eight cuts in the text, the plans and excavations are by Mr. A. Defasse and the text by M. H. Lechat, and the publication is an "ouvrage honoré d'une souscription du Ministère de l'Instruction publique et des Beaux-arts." It is published by Quantin. After a preface on literary sources (ancient and modern) as to Epidaurus before the excavations, the book falls into ten sections, dealing with the mythology of Asclepius, the valley of the Hieron and routes conducting to it, the temple, the chryselephantine statue, the Tholos, the temple of Artemis, the Stadion, Theatre, and other minor matters. The book concludes with an account of the festivals of Asclepius, and the pilgrimage made by the sick. As Epidaurus is a "set subject" in the archæological section of the Cambridge Classical subject, and for university as well as other students, the book will be found convenient.

THE Railway Commissioners, in their recent judgments, have generally managed to steer a middle course between the contestants, and the Northampton case,

which has just been concluded, forms no exception to this rule. Some of the increases complained of are held to be reasonable, and others unreasonable. It seems a pity that the issues in test cases (such as this and the coal case) should be sufficiently wide and complicated to allow of such compromises. Each side can claim the victory, but the precedents can hardly be sufficiently clear for either party to rely upon with much confidence. In the Northampton case it would appear that the alterations in cartage rebates actually convert a supposed increased rate into a reduced one; and that it required an expensive law suit to reveal the fact. The company have again succeeded in justifying certain advances on the ground of increase in working expenses, but only to a very limited extent; the Commissioners remarking that, making every allowance for such increased expenditure, there did not appear to be sufficient justification for increases being made in some of the charges complained of. But, although the advances thus sanctioned are only small, the London and North-Western Company will probably congratulate themselves upon the measure of success achieved.

LAST Monday a committee of the Corporation of Dublin met to decide between the rival schemes of two companies for the tramway service of their city. The scheme of the Southern District Tramways Company, which has an electric line from Ballsbridge to Dalkey, but has no branches inside the city, was approved of, way-leave for electric traction on thirteen miles of streets being given at an annual rental of 4,000*l*. On a vote being taken, 21 voted for the overhead trolley system, and 17 against. The electric equipment of the Dublin-Dalkey track is on the overhead system, span-wires being used, except on the main road through Kingstown, where there are centre-poles with double brackets, and also in one or two of the narrower streets. To electricians the power-station of the company is very interesting, being the only station where polyphase transmission of power on a large scale has been adopted in the United Kingdom. The power generated at the Ballsbridge station is transmitted at high pressure to the two sub-stations at Blackrock and Dalkey, and by means of polyphase motors coupled to dynamos it is converted into continuous current at a pressure of 500 volts, and transmitted to the trolley wires. This arrangement was rendered necessary, as the track is 7¾ miles in length, and the Board of Trade wisely insist in their regulations that the fall of pressure on the entire length of the return circuit shall not exceed seven volts. The rival company—the Dublin United Tramways Company—are petitioning Parliament to grant them permission to change to electric traction, and we anticipate that they will be successful. The new tramways will cross those of this company no less than eighteen times, occasionally at a very oblique angle. We wonder if the citizens really regard the prospect of having networks of wires along the sky lines of all the principal thoroughfares with equanimity, especially as the lines seem to a certain extent to duplicate one another. The rivalry between the companies may lead to a reduction of fares and a frequent service, but it would be a short-sighted policy on the part of the Corporation to consent to the planting of steel standards and the ripping up of miles of route where there is no chance of a paying traffic.

THE City Engineer of Norwich, Mr. Arthur E. Collins, has been addressing a schedule of questions to fifty-four towns as to their experience in the use of tarred macadam for streets. He has received fifty-four answers, of which however twenty-seven consist merely in the statement that they have had no experience in the use of the material named. The main conclusions to be drawn from the other twenty-three sets of answers, in spite of some degree of contradictory evidence, are pretty clear. We can gather that it is generally found to be not suitable for the heaviest type of traffic, that for light traffic it lasts better and is cleaner than ordinary macadam—in other words, the cost of maintenance and scavenging is less; but the initial cost is greater, and this cause of increased cost of course comes into play each time that the material has to be renewed, so that this constitutes a certain set-off against its longer endurance where the traffic is not too heavy. The Borough Engineer of Doncaster notes that "granite and non-absorbent stones are difficult to make a reliable job of, as the stone must be absolutely dry before mixing with the tar. Dross is much easier to deal with, but has not the same wear in it." The Borough Engineer of Maidstone observes that it is not suitable to use where there exists an ordinary macadam road at either end, as every vehicle would carry the mud of the latter on to the tarred road and rot it. The Borough Surveyor of Middlesborough prefers it to any other form of macadam, as less dusty in summer and less muddy in winter. The Borough Engineer of Hove thinks its great advantage is the decrease of noise. At Leeds, where it has been used experimentally in two places, the traffic is so heavy that it was impossible to keep these roads in good condition. The whole conclusion seems to be that it is an excellent and agreeable paving where traffic is not very heavy; that its cost of maintenance is less than ordinary macadam, but its initial cost greater; and that it cannot advantageously be introduced into the midst of a district of ordinary macadam but must be used over a whole district to obtain its full advantages. The Borough Engineer of Norwich has done good service in collecting and tabulating information on the subject.

A COURSE of three lectures on "The Chemistry of certain Metals and their Compounds used in Building, and the Changes produced in them by Air, Moisture, and Noxious Gases," by Professor John Millar Thomson, of King's College, was commenced at the Society of Arts on Monday last, the 17th inst. As might have been anticipated, the lecturer was only enabled to deal with so large a subject in three lectures, by commencing in a generalised manner; purely mechanical and metallurgical questions were not included. The metals specially selected for demonstration were iron, copper, zinc, lead, tin, aluminium, silver and gold. The principles underlying the expansion, &c., of metals on being heated, their electric conductivity, fusion, and volatilisation, were dealt with in detail, and some account was given of the colours imparted to flame by metals like sodium, lithium, and thorinum. Turning to the more physical aspect of the subject, the properties of tenacity, ductility, malleability, and elasticity were alluded to, but treated from a purely chemical point of view. The chemical operations involved in the union of metals with other bodies formed not the least interesting part of the lecture, which concluded by explaining the elementary principles of the extraction of metals from their ores. The subject of the course is one that has not been treated at any length in works on commercial chemistry, and information is badly wanted on many important points. It is to be hoped that Professor Thomson will follow up this general course by specialisations of different branches. A series of lectures, for instance, on the precise changes produced in different varieties of iron on being subjected to atmospheric influences in divers situations, going into the matter in full detail, would be of the utmost service to architects and engineers.

THE utilisation of waste of various kinds still continues to attract a large share of attention on the part of inventors. Mr. J. T. Fryer has patented a method of converting destructor ashes, clinkers, chippings and dust from stone, scavenging refuse, &c., into a species of concrete made with blue lias or other hydraulic lime. In the manufacture the mixture is shovelled into troughs divided into sections, and afterwards passed through a brick press. The blocks are made of the same materials in moulds or jackets, the unbinding of which prevents the setting from being jarred, and preserves the corners of the blocks from injury. The process is completed by stacking and drying the products in the open air. So long as the material produced is called "concrete," and not "bricks," there seems to be no objection to it—that is, for a certain class of work. The indiscriminate mixing of divers substances, such as are found in the refuse alluded to, would lead to very unequal weathering, on the blocks being placed in the wall of a building. The patentee remarks, that "the bricks and blocks contain no deleterious matter, and therefore are thoroughly sanitary." We would observe that the mere absence of deleterious matter does not necessarily constitute a "sanitary" concrete block, other qualities, such as porosity, having also to be taken into consideration. The value of the material for building purposes would largely depend on the quality of the hydraulic lime employed in the manufacture, and the care with which the process was conducted. In the hands of a person inexperienced in the mixing of high-class limes, we imagine that the concrete blocks would be comparatively worthless.

WHAT is believed and said to be the identical font at which the founder of the Sorbonne was baptised in October, 1201, is still to be seen in the picturesquely situated church of the village of Sorbon, near Rethel, in the Diocese of Rheims. It is of the simplest description, being a plain stone cylinder 9 in. in diameter, without base, surmounted by a simple square top, in which is a shallow "well" for the water. It stands 3 ft. 2½ in. high, the cylinder taking up 2 ft. 6 in. of that measurement. The top is square and measures 16¾ in. across. The font is placed in the south transept, the only available spot, and out of sight to all the congregation in the nave. There are many reasons for presuming this quaint little font to be the one that was standing at the beginning of the thirteenth century, even if its style be not taken into consideration, as there is documentary evidence at Rheims in the Archives, of the village of Sorbon being a pre-Roman settlement. The village is built over a vast network of subterranean vaults, and the walls of the church, though much damaged in the wars of La Fronde, still show signs of pre-Gothic work. It was in this church that a monument was erected, in 1888, to the memory of Robert de Sorbon.

ANOTHER of the London theatres has just been placed in the market—the lease of the Princess's being for sale. The present house was erected from the designs of Mr. C. J. Phipps, and under his superintendence. It has entrances in Oxford, Castle, and Winsley-streets, and a stage, including wings, measuring 71 ft. in width by 42 ft. in depth. The play-house was originally built for, we believe, one Hamlet, a London silversmith of great wealth After a fire at the Queen's Bazaar here, in 1829, the premises were reconstructed for him by Nelson, and reopened in 1841. The theatre is memorable for the performances held therein of Shakespeare's plays during the lesseeship of Charles Kean.

THE condition of the Museum at Lille, which has long been in so much need of repairs as to render it a very unfit building for the housing of valuable works of art, has attracted the attention of the French Department of Fine Arts, and three architects, MM. Vaudremer, Daumet, and Lisch, have been instructed to draw up a scheme for its thorough restoration. The Municipality of Lille, through whose neglect the Museum

has been allowed to get into its present state, seems now disposed to submit to the pressure put upon it by a Government department, and the necessary works are to be commenced without delay.

TENDERS have been made, as we have already announced (*vide* p. 63, *ante*), for altering and enlarging the "Bear and Rummer," in Mortimer-street, W., the architects being Messrs. Eedle & Meyers. The public-house is notable, in one respect, for on the Wells-street elevation is the old sculptured sign of a bear and rummer-glass, which seems to have escaped common observation, and is not mentioned in the chapter upon "Animals Real and Imaginary," of Mr. Philip Norman's volume (1893) upon London Signs and Inscriptions.

THE thirty-second annual exhibition of water-colours by members of the Dudley Gallery Art Society is now on view at the Egyptian Hall. The most original portion of the display is to be found in the collection of rather slight sketches on the end wall of the room, some of the best of them by ladies; Miss Margaret Bernard's sketches in France for instance (108, 115, 116), and Miss Jex-Blake's "Near Christchurch" (131), slightly executed in appearance, but showing real feeling for colour. Two or three sketches by Mr. David Green in the same part of the room should be noticed. Many of the more highly finished drawings are unfortunately rather mediocre in style and interest. Among those which are of more than average interest are "Holt Farm" (9) another of Miss Bernard's, "The Market, Old Whitby" (61) by Mr. J. Twigg, a drawing of some architectural interest; Mrs. Mary Stevens's "In the Engadine" (67), one of the larger works, with a fine mass of colour from the flowers in the foreground; "Showery Weather" (68), and "Moorland" (146) by Mr. Lexden Pocock; "Ragged Robin" (150), a very delicately treated landscape by Mr. Newton Benett; "Storm and Sunshine, St. Abbs" (156) by Mr. J. Blair, a fine study of stormy effect; "Arundel, from the Water Meadows" (164) by Mr. C. J. Adams; "On the Thames above Maple Durham" (178) by Mr. F. G. Coleridge; "Polperro," (174) by Mr. Hely Smith, a very picturesque sketch of the corner of an old harbour. Mr. R. W. Allan's "Chartres" (178) is a fine sketch in point of effect, but the architecture is very badly treated in detail.

AT Mr. Maclean's Gallery in the Haymarket is a small collection of paintings of Mr. Van Haanen's, all good in their way; several of them have been seen at the Academy in former years. In the same gallery is a miscellaneous collection, including some good works by Alfred de Breanski, Mdme. Dieterle, Henry Moore, Israels, and other painters of note.

THE usual annual course of Lectures at Carpenters' Hall, "on matters connected with building," will commence on Wednesday evening next with a lecture by Mr. H. H. Statham on "The Façades of the English Cathedrals," with lantern illustrations, most of which have been specially prepared for this occasion. Mr. A. Waterhouse, R.A., will take the chair. The remaining lectures on succeeding Wednesdays, will be by Mr. W. H. Preece (March 4) on "Electricity in connexion with Building;" by Professor Banister Fletcher (March 11) on "A Nation's Architecture;" Professor Roger Smith (March 18) on the "The Decay and Failure of Buildings"; and Mr. A. R. Binnie (March 25) on "The Blackwall Tunnel." The lectures, to which admission is free, commence at 8 p.m. We may also here draw attention to the lecture on "Architecture" which Professor Banister Fletcher will deliver in the lecture-theatre at King's College on Tuesday next (8 p.m.), to which also admission is free.

ROMANESQUE ARCHITECTURE.*

BY PROFESSOR AITCHISON, A.R.A.

IN the Lombard Romanesque treated in the last lecture, there is an affluence of wicker-work patterns as borders, sometimes even filling the centres of those panels which made the dwarf enclosures round the naves of churches for the clergy, formerly called the choirs; these borders are of great variety, sometimes marvellously intricate, and sometimes almost beautiful. There was, too, among these barbarians, a passion for figure and animal sculpture, not only portraying scriptural subjects, but also those of everyday life, and what has been called Bestiaries, or the portrayal of the animals and wild beasts of other countries, and even of mythical animals. It is curious to note the peculiar form of the chimera, and of some of the oriental martichores. Ctesias is, I believe, the authority for the existence of the martichore, and Apollonius of Tyana said he saw it, and it had the head of a man and the body of a lion. Those on a capital at St. Michael at Pavia are winged antelopes, with the head of a man, marvellously like those carved in wood on the Maristan of Kalaun (1279-1290). There are martichores damascened on Saracen vases, which may be meant for winged lions, but in both sorts the heads are crowned with tiaras. The Lombard sculpture is greatly varied in the drawing, modelling, and execution, and rises from the most childish attempts to a high degree of excellence. It is a truism to say that sculpture is not architecture, and was mostly not done by architects; but when it occurs in buildings, it not only forms a part of the general effect, but appeals in a more direct way to humanity than architecture itself, whose effects, though grand, are vague, and it lets us know, too, what the people of that day took an interest in and admired. We know that figure sculpture had fallen so low in Constantine's time, that Trajan's Triumphal Arch and Basilica had to be plundered to adorn the Arch of Constantine with figure sculpture. Still, bad as the Roman sculpture might then have been, it could not have competed in imbecility with that executed after the irruption of the barbarians. At Cividale there is a slab carved with a seated figure, having a nimbus, with two angels enclosed in a wreath. A hand from heaven comes through the wreath on to the nimbus, and the wreath is supported by four angels. Other slabs have the Magi presenting their offerings to the Madonna and Child, two saints, and the four beasts of the Apocalypse, supposed to have been sculptured about the third quarter of the eighth century; the three first of these are more imbecile and less like life than some of the textile figures from Panopolis; while there is at San Salvadore, at Brescia, and of the same century, the side of an ambo sculptured with a noble peacock among scrolls, of beautiful design and of vigorous execution.

Some of the capitals in various churches are tolerably close imitations of Corinthian ones. The hollowings of the leaves, however, look as if they had been gnawed out by insects, or rotted away, and point to a very low state of art and execution, as in the example of San Philisterius at Brescia. There are two lions on the Bishop's throne at San Ambrogio that are more comic than those at the Alhambra, which the visitor is told in the inscription not to be frightened at, for they are not alive. On the pulpit of the same basilica are wonderful beasts surrounded by scrolls, very northern in character. Among other sculpture there is a cock driving off a chimera and a double-tailed mermaid.

At St. Michael's, Pavia, there is Hercules strangling two dragons, and subjects from real life, as well as from sacred and traditional ones of extraordinary rudeness—*e.g.*, a little St. George is killing an enormous dragon with a gigantic spear, on the top of which is a small brush-tailed animal; hunting scenes, combats, and Adam and Eve by the Tree of Knowledge, with the serpent twined around it. The chimeras mostly have the neck and head of a goat, rising from the middle of the back of the lion, and a serpent's head at the end of the tail, like the fabulous mbulu of the Kaffirs. There are satirical subjects, too: I may mention two wolves, dressed as monks, being taught by a frocked jackass.

However imbecile or rude these sculptures may be, they show that the barbarians had their heads filled with sacred, ecclesiastic, or weird subjects that they wanted to be embodied, and got the best sculptors they could to portray them. We have admirable sculptors languishing for want of employment, but this great and enlightened age has no ideas on any subject past, present, or future, that it wants embodied.

Knowledge and admirable workmanship are no doubt great things, and strongly appeal to highly civilised people, but after all these are only the setting of the gem, and if there be no passionate desires nor high aspirations to express, are not these highly civilised people below the level of the barbarians who had the lofty thoughts but not the skill to express them? Speaking of architecture, when they could get their lofty ideas expressed decently, strike us. Everybody who has seen the interior of San Ambrogio must have felt that it was singularly impressive though bare and rude.

Anglo-Saxon.—One of the most interesting phases of Romanesque for us is the Anglo-Saxon, but until quite lately very little was known about it, though Fergusson has a short chapter on the subject. Architects knew from Britton the plan of Brixworth church and the tower of Earl's Barton, with its ornamented outside, showing the quoins of long and short work, and some of the baluster pillars; other baluster pillars may be seen in the triforium of St. Alban's. These baluster pillars seem to have been copied from those used in England by the Romans. Some of you may have seen Barton-on-Humber, Monkwearmouth, Deerhurst, and its font; but until Professor Baldwin Brown delivered his address on the subject at the Royal Institute of British Architects, and published his articles on it in the *Builder*, few, I think, knew much about it.

Though most architects had been posed by the prevalence of square-ended choirs in our cathedrals, few traced this feature back through the Saxon churches to Celtic influences, but were more inclined to attribute it to the want of artistic sense, and a desire for the display of stained glass. Professor Baldwin Brown, out of the fourteen churches and chapels he shows, gives eight with square ends, viz., Bradford-on-Avon, Wittering, St. Mary, Dover Castle, Monkwearmouth—if the absence of any end may be taken as a proof—Escombe, Bywell, and an oratory. He has shown how much greater are the proportions of length to width, as well as the proportions of height to width in the naves, than is common in more recent churches. He has given us the results of his researches on the Saxon masonry and brickwork. He has also shown us a specimen of the wooden walls of the church at Greenstead, Essex. The same new features are occasionally found in Saxon that are found in Lombard architecture, viz., engaged pilasters and columns as continuations of arch mouldings, as at Wittering, Northampton, and the compound pier at Bosham, Sussex.

The Scandinavians were, as barbarians, a very superior race, and though pirates, it must be recollected that in their day and much later, piracy was looked on as the trade of a gentleman, in fact, very much as getting letters of marque and starting a privateer were in the last century. In their voyages they had touched at most of the habitable coasts. North America is said to have been discovered by them long before its discovery by Sebastian Cabot. At Byzantium they were enrolled as the bodyguards of the emperor, under the name of Varangarians, as early as the ninth century, and are said to have subsequently included many of the Saxons of England, after the Conquest. Harold Hadrada, King of Norway, before he was killed at the battle of Bosworth Bridge (1066 A.D.), had recorded on the Lion of the Piræus, now at Venice, "that he had quelled a rebellion at Athens for the Byzantine Emperor, and was off to assist Tostig in England. It is possible that some of the Romanesque sculpture on the Cathedral at Athens was of his day.

Norman Architecture.—The Normans were a band of Norwegians, who, under their Chief Rollo, entered the Seine in 896 A.D. Rollo was accepted as Lord of Rouen by the bishop and citizens, and after raiding in the neighbourhood, and even besieging Paris, was eventually (in 912 A.D.) made Count of Normandy by Charles the Simple, who gave him his daughter in marriage; on this occasion Rollo embraced Christianity, and was baptised. When the rest of his band and their allies were converted, they took to having churches built in Normandy. William the Conqueror was the seventh Duke of Normandy, and as a penance for having married Matilda his cousin in 1054 was forced to found a monastery and a nunnery; these he had built at Caen with their churches of St. Stephen and the Holy Trinity. St. Stephen, called the "Abbaye aux Hommes," was begun in 1064 and was consecrated in 1067, and the Holy Trinity, the "Abbaye aux Dames," was begun 1062–64, and superintended

* Being the third Royal Academy Lecture on Architecture this Session. Delivered on Thursday evening, February 13, 1896.

by Lanfranc his Counsellor, afterwards Archbishop of Canterbury, and was dedicated in 1072. It is most probable that neither of these churches had their naves vaulted until the twelfth century. The interest that centres in these two churches is varied. They were churches begun by William, when he was Duke of Normandy; they were superintended by Lanfranc, afterwards Archbishop of Canterbury; and they are supposed to show a Lombard influence, Lanfranc having been of noble family of Pavia, and in all probability having employed Pavian architects. In St. Stephen's (L'Abbaye aux Hommes) the stonework is much more regularly coursed, and better bonded than at St. Michael's, Pavia. The plan was transeptal, with a narthex, and a semi-circular apse, a nave and aisles of eight bays between the narthex and the transept. The transept was about the width of the nave, and had two bays of choir and aisles between the transept and the starting of the apse; but this choir was rebuilt in the twelfth century. The projecting wings of the transept were divided into two bays, and on the east side had an absidiole to each wing. The aisles were arris groined, and the nave and triforiums were roofed with wood. The church was groin vaulted in the twelfth century. The front consisted of a gabled end between two towers. There were three doorways, one in the centre of each tower, and one in the middle of the front, with moulded and ornamented architraves, supported on two engaged columns. The gable end had plain semi-circular arched windows in two steps, and the towers were arcaded, but were without spires.

The plan of the Holy Trinity (L'Abbaye aux Dames) had also a narthex, was transeptal, and had an apse. The nave and aisles consisted of nine bays, from the narthex to the transept, the aisles being neither straight, parallel, nor equal, and arris groined. Instead of plain absidioles in the east side of the transept, there were long chapels with semi-circular ends; the aisles to the choir were also formed into long chapels with absidioles, whose main entrances were from the transept. This church, from some cause or other, was so ruined as to require rebuilding in the twelfth century, and was rebuilt from the springing of the nave arches upwards, and was, before its rebuilding, covered by a wooden roof.

There were many sorts of Romanesque in France, without speaking of the German varieties, the leading French one being that of the Isle of France. There were, for instance, that of Champagne, of Burgundy, the Angivine, and others too numerous to mention. The Norman variety is particularly interesting to us, as being, after Saxon times, our only Romanesque; but our object is not to copy Romanesque, but to learn what were the discoveries and developments that took place during the continuance of the style. The most important discoveries were those that led to the solution of the problem they were in quest of, namely, how to make a solid and secure stone ceiling that would protect their buildings from fire, at a cost within their means, and to well-light the naves of their churches. That this solution became a mere stepping-stone to a new development, is only an instance of how strict reasoning and extensive practice may carry its followers to lengths they never dreamed of, when they began.

The main discoveries of the Romanesque architects were these—the pointed arch, the vaulting ribs, and the flying buttress. When these discoveries were completed and put into execution, *i.e.*, when the architects could securely vault in stone a wide nave to a church that had aisles, and put in it clearstory windows that would amply light the nave, the object sought was found; and these architects might well have been contented to rest, and to use the formula they had got as future occasions called for it. Fortunately they were of another temper. The gradual though constant advancement in knowledge and skill of the Romanesque architects, the sharpening of their wits by observation and effort, their unconquerable determination to succeed after repeated and disastrous failure, steadfastly pursued through centuries; made them, like Alexander the Great, merely eager for fresh conquests. The result of this temper was the evolution, the perfecting, the decay and extinction of Gothic. By decay I mean the substitution of technical knowledge and skill for emotional effect, the making of all pierced work so thin and complicated that it looked like wire-work, and the overlaying of every surface with ornament, leaving nothing plain for the eye to rest on, and no foil to the enriched parts, so that the plainness and solidity of imitation Roman instantly killed it.

I think it will be not only interesting but useful to follow out as far as we can the reasoning, or what we suppose to be the reasoning, that caused their three great discoveries—the pointed arch, the vaulting ribs, and the flying buttress. The cause of their adopting the pointed arch seems simplicity itself. The keystone or key course in semicircular arches is nearly flat. When the keystone dropped from the spreading of the arch, its flatness seemed to be the reason; consequently, nothing was more natural than to substitute a joint for the keystone, and make the arch higher and pointed. It was hoped that these expedients would obviate the thrust, but, unfortunately, these alone were insufficient. The Romans, especially where they had long stones, had used transverse ribs coming down below the main barrel vault, to save centering, as at the Nymphæum at Nîmes, the prætorium at Mousmieh, and elsewhere. The Romanesque architects had used these transverse ribs at their main piers, and, it is supposed, had come to the conclusion that if they could get elastic ribs that carried down all thrusts on to the main pillars, the vaults would be free from failure. I must premise that in a uniform vault the groin point is the weak place. Every practical architect who has had to do with heavily-laden groined brick vaults knows that they generally fail at the groin point; consequently, if a rib could be substituted for the groin point, the vault would be safe. Crushed brick groin points often have to be cut out, and their place supplied by hard stone, each stone being long enough to take four courses of brickwork. Viollet-le-Duc believes that the ornamental ribs of the porch at Vézelay gave the hint, and he says "the great vaults, almost cupolas, of the Cathedrals of Angers and of Poitiers, are decorated with very thin-pointed vaulting ribs of no use, for instead of carrying the filling in, they are themselves carried by it, by being tailed into the scarcely projecting arrises of the vaults. But shortly, during the second half of the twelfth century, the architects of the north seized this decorative motive to establish their system of vault construction in ogive arches. They gave to the ogive arches great thickness and strength, not only enabling them to support themselves by the shape of their voussoirs, but enough for them to serve as centres on which they keyed up the triangles of filling, forming as many little vaults independent of one another, and resting all their weight on these centres"; and he may be right, for when every architect was looking for a solution, an accident might have started them on the right track. I do not know that it is possible to follow out the working of this principle, the conversion of a supported ornamental rib into one that was not only self-supporting, but which carried the filling. All that can be said is, that the Gothic choir of this church, built not long after the Romanesque vaulting of the porch, has real groining ribs; otherwise M. Corroyer's theory has much greater inherent probability. M. Corroyer has published those instructive and charming books on Romanesque and Gothic, that are so universally and so justly popular, to whose kindness I am indebted for some of the illustrations. He states his conviction that the ribs in vaulting were an original device for enabling cupolas to be built of a lighter substance than as pure domes, and that having been thus started, the idea was seized on as the solution of the problem all the architects were seeking. In the beginning of the eleventh century, St. Front at Perigueux, like St. Mark's at Venice later on, was built on the model of the Holy Apostles at Constantinople, but while St. Mark's was built of brick, after the Byzantine manner, St. Front was built of cut stone, and was imitated at Cahors, Angoulême, Solignac, Fontevrault, and elsewhere; but the heavy walls and abutments wanted, as well as the labour of working the stones of the cupolas, were too great an expense for poor places to indulge in. At St. Avit, Séneur, light ribs were carried below the cupola, being the diagonal ribs, ridge ribs, and transverse ribs; on these ribs a much thinner shell was able to be built than the ordinary shell of a cupola. This same cupola form on ribs is found at St. Peter's, Saumur, and at a church at Ripin in Jutland.

At St. Ambrogio, at Milan, the vaults are also domical with square ribs, but the exact date of the vaulting is not known. As an antiquarian problem, nothing could be a more useful nor a more interesting study than the origin and sequence of these ribs, whose supreme importance was in the rise and development of Gothic. Unfortunately, the following out of such an investigation does not wholly depend on industry, but on the accident of structural repairs being carried out at the time that the skilled investigator can go to the spot, and to undoubted evidence of dates being forthcoming. If the regular sequence of examples should be found out, the interest is purely intellectual; it has now no bearing on the practical work of the world, for ten times the span could easily be covered with iron girders, and be made fireproof with concrete and plaster.

At the Church of Vezelay, the porch of which is believed to be of the early part of the twelfth century, the vault of its nave is abutted by half-vaults over the triforium under the aisle roofs, and consequently there is no clearstory.

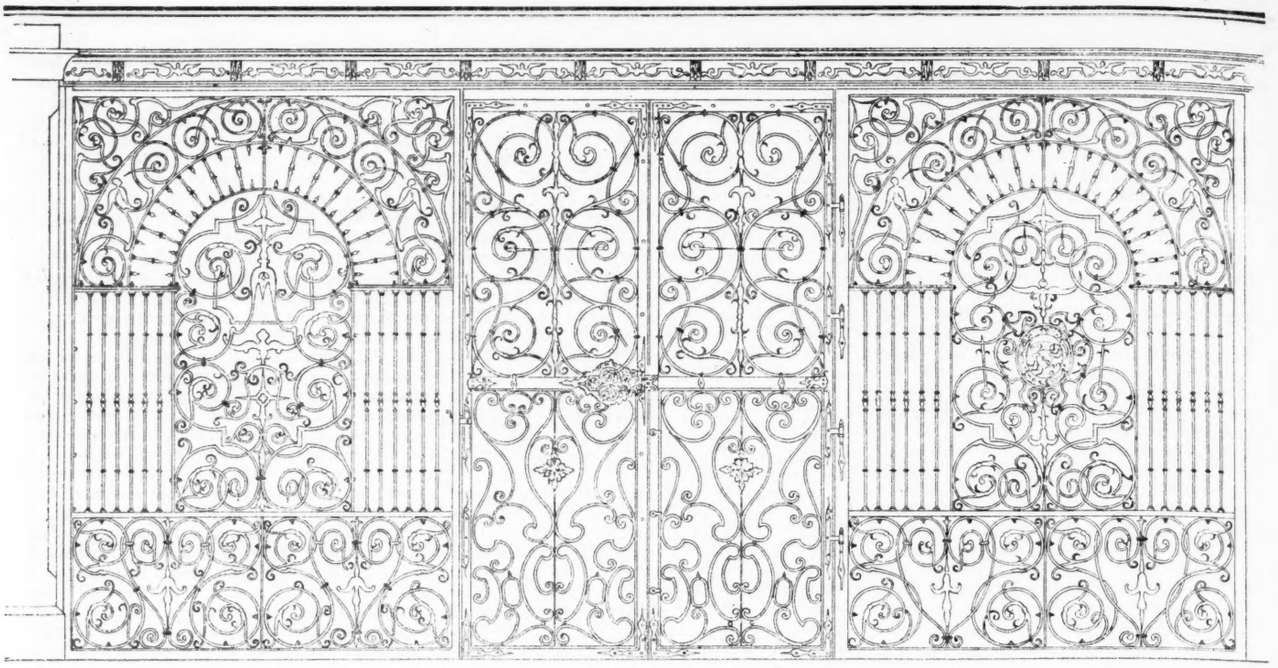
In the nave, which is supposed to be of the eleventh century, and has no triforium, there are windows above the level of the springing of the vaults, and the vaults are abutted on one side by a solid triangle of masonry, built on the transverse rib of the aisle vaults, up to the underside of the roof; and on the other side by flying buttresses above the roof of the aisles, but whether these flying buttresses are of later date I cannot say.

At Southwell Minster, buttresses practically flying are under the aisle roof, as at Durham, at Cerisy-la-Forêt, at St. Gabriel, Calvados, and at L'Abbaye aux Hommes, Caen, when it was vaulted. These Romanesque architects became the most logical of thinkers in matters of building, and asked themselves why it was necessary to abut groined vaults by a continuous abutment, whose whole thrust was at the meeting of the transverse and diagonal ribs; as was done at St. Paul at Issoire, where the nave had a barrel vault, and was of the end of the eleventh century, so they eventually made the flying buttress to abut the thrust at the point of pressure. One of the first of these exposed flying buttresses was at St. Remy, Reims, in the latter half of the twelfth century; this theoretical expedient, however, did not always succeed, and two points of abutment were given to the flying buttresses, one above and one below the theoretical point of pressure.

I have picked out the great constructive inventions of the Romanesque architects, but, curiously enough, these three constructive inventions have become, in the hands of succeeding Gothic architects, the most strikingly artistic inventions too. The pointed arch has given a new æsthetic character to the inside of buildings, and so have the vaulting ribs, while the flying buttresses, or stone shores, have stamped ecclesiastical buildings at least with a character that never appeared before, and hitherto has never appeared since, except, of course, in modern Gothic paraphrases, when the expense of vaulting has been incurred.

I want, however, to point out a characteristic peculiarity of these much-despised Romanesque architects that, though inevitable and palpable, has rarely been brought forward, at any rate with sufficient prominence. If a hundred architects were asked what is the main characteristic of the Romanesque architects, the probability is that few of the number would give the right answer, that they were the inventors of modern architecture. This statement looks like a paradox, and if architecture were not the creating of organisms, but were merely the altering of outward forms to please the whim of the day, it would not be true; I mean that if the mere outward form alone constituted architecture, it would be absurd to say that a building clothed in Roman clothes was Romanesque; but it must be palpable that when the Roman Empire and organisation was destroyed, Roman architecture could not be again used till a similar organisation had been re-created, and this has certainly not yet taken place in Europe. Buildings could, therefore, no longer be run in rubble or concrete, for there were no longer imperial funds to carry them on. Vast hordes of unskilled labourers were no longer to be procured, nor could they be brought rapidly to one place. Mere mass for abutments could no longer be afforded. The care, ingenuity, frugality, and counterpoise used by the Romanesque or Gothic architects had still to be adopted by those of the Renaissance, only clothed in the new fashion; not designed, it is true, with the skill and frugality of Romanesque or Gothic, but with much more skill and frugality than was used in Roman days.

In the beginning of Romanesque days, everyone, with few exceptions, was reduced to an almost barbaric state; but peace, industry, and learning had entirely altered this condition by the end of the eleventh century, until, shortly after the middle of the twelfth century, vaulted buildings could be executed with security and considerable emotional effect.



Grille, Wynyard Park, near Stockton (date, 1648). Drawn by Mr. Jas. A. Lofthouse.

It is no longer allowable for architects to learn by failure, on the contrary they have to learn how to avoid it. When you have no one to teach you, you must teach yourselves, and the proverb that "self-taught is well-taught," is as true as ever. By a careful study of Romanesque architecture and its literature, you can learn the efforts that were made by the architects, and how they eventually overcame the difficulties that beset them, and from their works you can also learn how emotional effects of a very high order were produced.

WROUGHT IRON GRILLE, WYNYARD PARK.

THIS grille is situated at the entrance to the gardens and conservatories at Wynyard Park, near Stockton, the English seat of the Marquis of Londonderry. It is of foreign manufacture, having been brought over from Austria by a former Marquis, who was British ambassador at Vienna. It is of the most exquisite workmanship, being beautifully wrought, and finely put together, but I regret to say some of the most ornamental details, such as the locks, have suffered a good deal from weather. The date on the coat of arms is 1648. JAS. A. LOFTHOUSE.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

THE eighth ordinary meeting of this Institute was held on Monday last, at 9, Conduit-street, Mr. F. C. Penrose, M.A. (President) in the chair.

Mr. R. Phené Spiers, F.S.A., read a paper on "Saint-Front de Périgueux and the Domed Churches of Périgord and La Charente," of which the following is a *résumé*:—

In opening his paper Mr. Spiers referred to M. de Verneilh's work on Saint-Front of Périgueux, published in 1851, and still the only standard work on the subject. The principal objects sought by M. Verneilh to be proved in this work were: firstly, that the church of Saint-Front was copied from the church of St. Mark's at Venice; secondly, that it was founded about 984 and dedicated in 1047, and was the prototype of all the domed churches in Aquitaine; and thirdly, that, being copied from St. Mark's of Venice, which was inspired by St. Sophia at Constantinople,* the French domes had a Byzantine origin.

The researches of the last few years, however, have proved that the five-domed church of St. Mark's was not commenced till 1063, so that a later date would have to be ascribed to Saint-Front.

The records of the period, however, distinctly point to a church of some kind having been founded towards the close of the tenth century and dedicated in 1047, and this directed the lecturer's attention to the remains of an older church of basilican type, hitherto ascribed to Chronopius II., Bishop of Périgueux 503-530, but which Mr. Spiers contended could not be anterior to the eleventh century. After describing the five-domed church and the old or Latin church, the lecturer proceeded to examine in detail the features of this older church, of which portions of the nave—the aisle walls complete, the west front and the narthex still remain.

The piers of the nave, now embedded in the substructure of the tower, are compound in plan (that is to say, they have attached pilasters or responds on either side), which form was not adopted in France before the eleventh century; the aisles were vaulted with barrel vaults placed at right angles to the nave. The earliest dated example known of such a feature is found in the narthex at Tournus (1009 A.D.) near Cluny. From the east of France it crossed to Limoges, where similar vaults were built in 1028, and thence probably descended to Périgueux about 1030. The west front and porch are both built in ashlar masonry, with figure sculpture and other decoration, which would be somewhat in advance of its time, even if completed in 1047.

The lecturer then passed in review the five-domed church, the construction of which was of a much more advanced standard, particularly that of the arched vaults and pendentives, than other eleventh-century work in France; whilst the sculptural decoration of the advanced Romanesque type, quite devoid of any Byzantine influence, such as is found elsewhere, partook more of the character of middle twelfth-century work. Mr. Spiers then referred to a second record, which stated that Saint-Front was burnt down in 1120 in a great and sudden conflagration. This, Mr. Spiers maintained, could not refer to the five-domed church, which is entirely built in stone and without any timber in its construction, whereas it is known that the nave of the basilican church had a timber roof. The last paragraph of the record also says, "At that time the monastery was covered with timber roofs," which, in the lecturer's opinion, showed clearly that the chronicler desired to show a distinction between the earlier church and the existing one built entirely of stone.

Having thus attempted to prove that the five-domed church of Saint-Front was not built before the twelfth century, Mr. Spiers found another task imposed on him—viz., that of showing that domed churches were built in France early in the eleventh century, and that their structure differed entirely from that employed in eastern domes; the arches being pointed, the pendentives having a double curvature and being built with horizontal courses, and the domes being ovoid in section. The peculiar construction of the pendentives, which were set out on the intrados of the arch instead of the extrados as in the east, was explained by several diagrams, and Mr. Spiers claimed that such a method of building was not known in Byzantine domes. The churches of St. Astier (1013), St. Stephen of Périgueux (1013–1047), Solignac, Souillac, Fontevrault, and Angoulême, and other churches in the Charente were then passed in review, and the complete absence of any Byzantine sculpture, especially in the earlier examples, suggested that they were in no way influenced by Eastern models. It was in fact the negative quality in Saint-Front, the entire absence of any Byzantine feeling in it, which first led to Mr. Spiers's doubts about the date given for the five-domed church. The results of his inquiry led him to the belief that, so far from being the first domed church, Saint-Front was the last of any importance built, and that the term Byzantine as applied to the domed churches in France is misplaced. The French masons of the south of France have already the credit of having perfected a type of church with barrel-vaults in stone covered with stone roofs; to them also is due, Mr. Spiers contended, an alternative method of roofing their naves with a series of domes or of the employment of barrel-vaults for the nave and domes for the crossing; the domes being constructed, in all cases and including Saint-Front, in a manner peculiar to themselves and subject to no foreign influence.

The President, in inviting discussion, said he had listened to the paper with very great pleasure, as twenty-one years ago he had gone over the district under the best possible guidance—viz., with Mr. Edmund Sharpe.

Mr. J. S. Quilter proposed a vote of thanks to Mr. Spiers. He was sorry that the lecturer had not referred to Mr. Sharpe's opinion on the subject of the pendentives. Mr. Sharpe went fully into the matter at the time, and his opinions were given in the book on the Charente, published in memory of him. He might point out that there was an example of pendentives over their heads that evening, which might afford a simpler explanation than the diagrams of Mr. Spiers. He did not see why Mr. Spiers objected to an expression of one of the French architects, viz., that it was a dome on a dome—that the lower dome was constructed from the square basis, and at a certain point in its circumference became circular, on which the other dome was started. These points involved a good deal of difference of opinion, and he thought he would be doing the best at that late hour of the evening by contenting himself with proposing a vote of thanks to Mr. Spiers for the very able way in which he had treated the subject.

Mr. H. L. Florence, in seconding the vote of thanks, said that he had listened with great interest to this very carefully studied paper on the subject. There were so many considerations and technical points involved that it was very difficult to follow them closely. At the same time, there was one lesson to be learned from it, viz., not to take everything one saw for granted which had been measured and drawn. It was evident that many of the conclusions contained in the books

* It is known now to have been inspired by the church of the Holy Apostles at Constantinople, described by Procopius and pulled down in 1460 to make way for the Mosque of Mohamet II.

and publications on which people had pinned their faith for the last quarter of a century, if looked at in the natural lights of the further knowledge gained, might possibly lead to different conclusions, such as those Mr. Spiers had arrived at by careful study. This showed that the work of the architect was not yet accomplished, and that they were not to rest contented with the mere fact that a building had been measured and illustrated. There was no doubt that they had been led too much by tradition, and a more careful study and further knowledge might cause them to alter the accepted conclusions.

Mr. Tavenor-Perry remarked that the paper read that evening was of extreme value to architects because, he was afraid, none of them would ever go to examine the building. He understood it had been pulled down and put up again; therefore the date of Périgueux was fixed.

The President added that when on the expedition referred to they were very much struck with the construction of the pendentives, being, as Mr. Spiers said, formed on the intrados, instead of on the extrados. The way in which Mr. Spiers had brought out the probable later date of Saint-Front was extremely interesting, as it had been taken for granted very much on the authority of M. de Verneilh, and he considered that the lecturer had proved his point from a comparison of the work upon St. Stephen and Saint-Front, Périgueux. He thought it was extremely probable that the introduction of the pointed arch into Europe was owing to these domed churches, from finding that the central points of the round arches, when loaded, were likely to fall in, so that the pointed arch became almost a necessity for carrying the dome. The pointed arch, as Lord Leighton used to say in his admirable addresses to his students, did not give them Gothic architecture; but, as was most probable, the development of ribbed vaulting gave true Gothic architecture, the pointed arch being ready to hand as derived from these domes. He believed that this was an extremely interesting step in the history of their art.

The vote of thanks was then put, and carried by acclamation.

Mr. Spiers, in replying, said that Verneilh's difficulty was this, that he, no doubt, was perfectly willing to place the building of Saint-Front at 1030, but, unfortunately, he could not, as St. Astier was in his way. He (the speaker) having been able to examine the walls and masonry, and one or two portions of the building which was not possible before, considered that both in its execution and decoration, the five-domed church could not have been erected before the twelfth century. Instead of being the first domed church, it was the last of any size. M. Verneilh was ten years in Périgueux, but not being an architect, he did not recognise the leaning over of the voussoirs. Those in Mr. Sharpe's party recognised at once that the voussoirs leant over, and that demonstrated the difference between the man who understood construction, and the work even of a most diligent outsider like M. de Verneilh. Possibly, the points that he had raised that evening might lead to a good deal of discussion in France, but the French would be glad to hear that they had not been copying either Saint Mark's or Sta. Sophia, but had invented a dome of their own.

The President announced that a special general meeting would be held on Monday, March 2, for the election of Mr. Ernest George as Royal Gold Medallist for the current year, at the conclusion of which a business meeting would take place for the election of members.

The proceedings then terminated.

THE CONDITIONS OF BUILDING CONTRACTS.

On Monday last Mr. A. A. Hudson read a paper on "The Conditions of Building Contracts" before the Surveyors' Institution. Mr. Daniel Watney (President) in the chair. After some preliminary remarks, Mr. Hudson said:—

The first condition to be considered is the one which fixes the standard of excellence required for the work. The work may be described to be of the best, or it may be described to be to the satisfaction of the employer, or to the satisfaction of the architect or surveyor, or both, or it may be described, as most frequently happens, to be of the best as well as to the satisfaction of the architect or surveyor. By surveyor I am not referring to the surveyor in his capacity of quantity surveyor. Now the first description, viz., of work to be done in the best manner, is not desirable from an employer's point of view, because best is such an uncertain term, that standing alone a contract on those lines would open the door to endless disputes. The second description is almost equally objectionable, because if work has to be done to the approval of the employer, such approval must be reasonable, for no one can be judge in his own cause unless the parties agree to such a condition in express terms. There may in this case, therefore, be endless disputes as to what is reasonable.

It therefore becomes necessary, in order to avoid disputes as to what is best under the first description or what ought to be approved in the second description, to find a course which will avoid such disputes; and a way has been found out of the difficulty by providing that the work shall be done to the satisfaction of a third person —the architect, engineer, or surveyor. And the difficulty is overcome because in such cases the approval or disapproval of an architect, engineer, or surveyor, although he is naturally interested and biassed in favour of his employer due to his position, has been held to be final in the absence of fraud or dishonesty, or some disqualification not known to the builder, and not naturally incident to his position as agent to his employer. The effect of a condition of that kind is that the standard of excellence is the mind of the architect, engineer, or surveyor, and it does not affect that standard even if other descriptions are added, such as best or second best. The only object of inserting what may in some cases be dependent on the standard of excellence of the architect be two inconsistent provisions in the same contract, is that in case anything should happen to prevent the architect approving, then the other description of best or second best, for instance, would be the only standard left upon which to determine whether the work was according to contract or not. As an instance of this, suppose the employer refused to proceed with the contract, then the architect would have no further power to bind the builder by his decisions as to quality. The reason for this is that architects' powers arise under the contract, and if that is entirely broken and at an end, he cannot have any powers under a contract which has ceased to exist, or, in other words, which has ceased to be the means for regulating the relations between the parties. Another instance may be given by supposing a case where the architect or engineer never exercised his judgment at all. Though this kind of contract is highly satisfactory to an employer or building owner, the builder is not of the same opinion—if I may take the Master Builders' Association as representing the opinion of builders generally. They agree to the architect being final in certain matters, but there appears to be a limit and perhaps a just limit, to such confidence in the architect of the building-owner as expressed by those conditions. They do not agree to do work to the satisfaction of the architect, but they agree to do it to his reasonable satisfaction; nor do they agree that if they do not satisfy the architect they are not to be paid at all, nor do they agree that the employer may take possession of the works and turn the builder out if he does not satisfy the architect, nor that the architect shall have power to alter the work or reject the materials at the builders' expense. In those matters he says no, in case of dispute I must be allowed to refer to arbitration. Arbitrations, no doubt, are disliked by employers, but when matters are looked at fairly it cannot be said that the builder is unreasonable in not placing himself hand and foot in the power of a person whose natural interests are to decide in favour of his employer. This question is the basis of all building and engineering contracts, and each contract must be dependent on the person to be employed as architect or engineer, and the kind of person or corporate body who is in the position of employer.

To this day contractors for large railway and other works enter into contracts for immense sums, leaving themselves entirely in the hands of the engineer, whereas in works involving the expenditure of a few hundreds a builder will not sign a contract without an arbitration clause. The reason of this appears to be that contractors know that engineers for companies with large funds have absolute control of the money spent, and that the employers pay without demur whatever he certifies for, and further than this, the engineers in such a position do not feel that they are bound down to the strict letter of the contract, but are able to act in a fair spirit between their employers and the contractor. In small works, however, where the client has limited means, extras are closely scrutinised by him. He not only questions the amount of extras, but the authority of the architect to order them, and the architect who acts for such a client cannot but feel in a difficult position, a position in which I am sure he in many cases would rather not occupy. The builder therefore in such a case confers a benefit on the architect, if not on the employer, by refusing to contract without an arbitration clause.

Then there is another kind of contract, the contract with corporations and public bodies. The employers in these cases are controlled, to a great extent, by a body of ratepayers, many of them watching the works eagerly for opportunity to distinguish themselves by finding some fault in the work, or by discovering some payment which ought not to be made. Neither the builder, therefore, nor the engineer is in an enviable position, and the engineer often dares not do as he thinks right for fear of dismissal.

The next important distinction between building and other contracts is that the work to be done is done on the property of the employer, becomes attached to the soil, and thus belongs to the owner of the soil, whoever he may be. The effect of this is, that while in the supply of goods they may be returned, if not according to sample or up to the quantity contracted for (except in certain cases to which it is not necessary here to refer), in the case of work attached to the soil, it cannot be returned.

Important conditions, therefore, become necessary in building contracts to provide what is to happen if work is not according to the specification or not to approval. These conditions generally consist of a power in the architect or the employer (subject in some cases to reference to the arbitrator) to call upon the builder to re-execute the defective work, and a further power in the event of failure to comply with such requisition for the architect to employ other persons to do the particular part of the work which is said to be defective, or sometimes a still greater power is given to the employer of taking the whole work out of the contractor's hands.

Now it must be seen that this is one of the many causes of difference in the settlement of the conditions of building contracts, and the question arises: Is the builder justified in placing himself wholly into the hands of a person whom everyone must expect to be interested in favour of his employer, or are the powers before described to be exercised reasonably and be subject to appeal to some other tribunal if not so exercised, and on the other hand, is the employer justified in signing a contract in which there may be a dispute about every item, and there may be thousands, giving rise to endless litigation or arbitration?

The answer to these questions is difficult. As far as I have been able to judge, I think that both builder and employer would be far better to leave themselves entirely in the hands of an architect, engineer, or surveyor whom both parties can rely upon as possessing sufficient force of character to see that right is done without fear or favour, but such a contract could not be one of general application, for it would be a contract entirely dependent on the particular character of an individual.

The position of architects, engineers, and surveyors under building and engineering contracts in which their decisions are final is an extraordinary one, and one in which only those possessed of the highest attributes for fairness and impartiality can properly occupy. Fortunately those attributes are widespread and their absence is an exception. Under such contracts the architect or engineer is more absolute and has more power over the property of a fellow-creature than any judge on the bench, but just as his powers for good or evil are great so are his responsibilities; he must therefore perform his duties upon a strict standard of fairness and impartiality for what might be described as unreasonableness in an agent might be unfairness or dishonesty in a person occupying such a position. Architects, however, accept these positions, and there is no reason why they should not, but they must not forget their position, and it is incumbent on them to be very careful. I am sure that the great majority of architects would be able to say they never had a dispute during their professional career upon anything affecting the exercise of their duties to a contractor. But there are some architects who use their powers as they should not do, whether to improve their own position with their employers, or because they are careless whether injury is caused to a builder or not, or often because they are weak enough to be over-persuaded by an employer, and it is against these that the builder should be entitled to protection.

The next important condition is the payment clause, and perhaps one upon which the builders

place more store than any other. Here again it is necessary to consider the reasons which call for special provisions about payment in building contracts as distinguished from payment clauses in other kinds of contracts. Special conditions are necessary in building contracts, firstly because builders generally require advances on account, and secondly because variations in the contracts are frequent; and unless the employer has special knowledge he is not competent to ascertain the value of work done from time to time or to estimate the value of deviations from the contract, and it becomes necessary that some one must perform this duty. If there were no extras and no advances, then the employer would merely have to pay a lump sum and these matters would end. Now the employer naturally desires that his architect should settle these matters, and the best contract in the interest of an employer which can be entered into apart from minor details is that the builder shall do the work (in a certain time) to the satisfaction of the architect, and be paid only the amount which the architect certifies to be due. The Builders' Association, as representing the general body of builders as I have said, agree to certain things, but they object to being only paid on the certificate of the architect, and the reasons for this objection are not far to seek. They do not mind carrying out all the architect requires, but they want to be adequately paid, and they no doubt also consider that the bias of the architect natural to his position is so great when it comes to a question of presenting the employer with a long bill of extras, that the architect would be unfairly tempted to unduly cut down the price. It seems to me also that they must have some doubt in the case of architects as distinguished from surveyors whether many of them really know sufficient about the details of prices to properly value the work for an advance, or certainly not for final payment, and they cannot also be unmindful that the architectural profession as a body have been disputing amongst themselves whether they are artists or architects. The last person whom a builder would desire to value building work would be an artist, not because he would not act fairly, but because he does not know what he is called upon to value. These considerations seem to underlie the objection of builders to leave themselves entirely in the hands of architects as to payment.

The question is what is the best alternative, and it would seem that a third person (not the architect) should be employed for that purpose. Quantity surveyors frequently perform this duty, and their employment seems open to no objection, whether by the builder or the employer, and the duties thus performed are done with a skill to which no architect could hope to attain who had not mastered the details of quantities and valuations, and, further than that, who had not kept himself up to date by constant practice in that kind of work. But this arrangement might I think, be much improved by providing in the contract not only that the quantity surveyor should measure and value for advances and the final adjustment of account, but that he should certify the amount of his valuation and that the builder should be paid on his certificate. It is unfair, I think, to architects to expect them to depute duties of this kind and be held responsible to their employers for any mistakes or negligence in the performance of such duties. I think that the quantity surveyor should be jointly employed by the builder and the employer, be paid half by one and half by the other, to avoid any suggestion of bias, and be responsible to both. In the present ordinary employment of a quantity surveyor by the architect to measure up work for him, if the quantity surveyor should by chance be negligent and make out an account for more than was due to the builder, and the architect adopts his figures and certifies the amount to the builder, the architect is responsible to his employer in damages. No doubt it will be said that this arrangement would necessitate bringing the question of the quantities and the quantity surveyor before the employer instead of their being kept in the background, but the answer to this is simple; all employers should be told everything and if it is necessary that a quantity surveyor should take out quantities or measure up, he should also be told that a quantity surveyor is employed. Not only would it, I think, be advisable to place the quantity surveyor in an open and recognised position under the contract, but I think in the interests of both parties his certificate might be final as to payment, and if the quantity surveyor were nominated by the builder as well as the employer or architect, neither party should have any objection to such a condition. But the payment thus ascertained to be due probably would only include payment for work done. It is not likely in most cases that the parties would agree that questions of damages for breaches of contract should be ascertained in the same manner. Arbitration appears the best alternative. That brings me to the third main clause in a contract, viz., the arbitration clause.

With regard to the arbitration clause, a recent decision of the Court of Appeal has made the consideration of this clause most important. If I may so describe them, arbitration clauses are either general—by that term I mean they constitute a submission to arbitration of all disputes which may arise between the parties—or they are only limited, that is to say, they constitute a submission to arbitration of particular disputes only. The arbitration clause agreed upon between the Royal Institute of British Architects and the Builders' Association was a limited submission, and the architect's decision in certain matters was not open to dispute or arbitration. Now if the architect's decision in certain agreed matters were final, and the quantity surveyor's decision as to payments were final, those two matters might at any rate be excluded from the submission. But the cause of frequent difficulties in the interpretation of these arbitration clauses is that there often is a general clause submitting all disputes to arbitration, and another clause making the architect's decision final by his certificate in respect of the same matters. I think it will be recognised that in all cases of arbitration there is an enormous amount of matter which goes to the arbitrator which might very well be left to a valuer. The questions which go to an arbitrator are generally questions of value, questions of measurement, and questions of damages. The questions of value and of measurement are surely within the province of a surveyor, and such questions are constantly referred to a surveyor by the arbitrator even when an arbitration has taken place, and therefore it seems desirable that, in dealing with a building contract, those matters should be excluded from arbitration proper, and made really the subject of valuation.*

LECTURES ON SCULPTURE AT THE ROYAL ACADEMY.

IN the first of his Royal Academy sculpture lectures on "The Representations of Deities" on Monday, Dr. Murray said that in general nothing was more familiar in the remains of Greek art than the forms and actions of the gods, but he wished to speak of scenes in which they appeared as invisible spectators of, or participants in, actions which transpire on earth. As a rule, these scenes belonged to the region of legend, and not to historical events, though there was one important exception in the case of a large vase in the Naples Museum, which is painted with a number of figures representing the Persian King Darius receiving tribute, and in the upper field a number of Greek deities, including Zeus. Sometimes, said the lecturer, the pictures on the vases exhibit an immediate interference on the part of the gods, who, however, were invisible, and in this connexion he referred to two vases belonging to the Archaic period of the sixth century B.C. The contrast which they represented to the later vases, where the gods occupy a serene position above the incidents which they may be supposed to contemplate, indicated a change of mind and thought in regard to the action of the gods. The two older vases take us back to the time when the Iliad was the standard book in the education of the Greeks, and fortunately we have the Iliad to turn to as an open page where we may read the thoughts of those earlier Greeks concerning their gods. The lecturer then mentioned some of the more important incidents of the Iliad bearing upon the argument, his object being to show that even in the early times of the Iliad, in which there was apparently so much familiarity with deities, it was after all felt that the gods must be invisible, and that it could only be under a disguise, or under the cover of a mist, that they could actually interfere in human affairs. The constant struggle in the minds of the Greeks between a firmly established conviction that the gods were always invisible, and a passionate desire to know them directly and actually, must, he thought, have been the origin of that peculiar state of imagination which led the Greeks to create so large a number of allegorical beings who were not gods, who, as a rule, had no myths or legends attaching to them, and who were personifications of natural or mental phenomena, such as countries, localities, rains, clouds, health, old age, peace, justice, injustice, &c. These figures occurred seldom in sculpture, but in a drawing of a slab from Delphi, which Dr. Murray exhibited (one of those recently discovered by the French), was a representation of Nemesis seated among the gods, the name being written beside her. It was chiefly on the painted vases that the numerous personifications to which he had referred were to be found. But it did not follow that they were the creation of the vase painters. Extraordinary as was the skill of the vase painter, it only seldom left on us the impression of creative power. One was constantly speculating on some possible fresco or bas-relief, now lost, which had been the source of the design on the vase. But still it was possible that those vase painters were, in a number of instances, the actual creators of the personifications existing chiefly on the vases. The crowd of imaginary beings, representing almost every conceivable phase of nature and of mental phenomena, came into existence chiefly during the most flourishing period of Greek art. What must have been the state of the artistic imagination in that period when it could seize upon abstractions such as wealth, power, peace, health, harmony, and create for them bodily forms? So far as he knew there was no other nation who could show in its art a corresponding period of purely imaginative creation. The period he was referring to extended from 450 B.C. to about 350 B.C., that being the period of the vases on which the personifications chiefly occur. The greatest of the Greek painters in the days when personification was triumphant was Apelles, of whom it was said by Pliny that he painted things which could not be painted, and whose picture, "Calumny," had been described with some detail by Lucian. The lecturer then dealt with several representations on vases, and in conclusion he briefly referred to the loss which the Academy had sustained in the death of Lord Leighton.

THE STABILITY OF TALL CHIMNEYS.

UNDER the auspices of the Institution of Junior Engineers a paper on "The Stability of Tall Chimneys" was read by Mr. F. J. Bancroft, B.Sc., at the Westminster Palace Hotel, on the 14th inst. Mr. H. J. Young presided.

Having drawn attention to the danger to life, destruction of property, and loss of business which often ensued from the fall of a tall shaft, the author enumerated the characteristics exhibited by chimneys that had fallen. Such shafts had usually been observed to "sway" or "rock," which movement, although a source of alarm to some people, had by others been regarded as an essential condition of safety, and showed the admirable elasticity possessed by the structure; cracks had also been traceable, starting on the windward side and descending obliquely to the leeward side of the shaft, which had finally collapsed by the crushing of the material through the concentration of the pressure on one side. No reliance should be placed on the tenacity of the mortar, since the erection might have to withstand a gale while the work was new; pressure should therefore be present over the whole of the bed joint, and in no case be less than zero, so as to become a tensile stress. It was thus necessary to limit the position of the centre of pressure, so that the maximum stress should not exceed twice the mean, and that no tensile stress be caused. The determination of the limiting position of the centre of pressure for square and circular shafts, having regard to the thickness of brickwork in each case, was then considered, and it was shown that it was only when the brickwork became infinitely thin that it was permissible to be at one-sixth of the diameter from the leeward side for square shafts, and to be at one-fourth of the diameter from the side for round shafts, these being the values given by Rankine, and copied into many works without reference to the relative thickness of the brickwork to the outside measurement of the shaft. This was shown to be an important point, causing an error of 58 per cent. in the calculation of the safe wind pressure in a square shaft, the thickness of brickwork being taken at a quarter of the diameter. Calculations of a shaft that had actually fallen were then made, from which it was seen that a wind-pressure of about 16 lbs. per square foot would be sufficient to cause tensional stress, and that the weak place was at the second set-off, where the shaft ultimately failed. The author combated the idea of

* The remainder of Mr. Hudson's paper will be given next week.

rocking being indicative of safety, and showed that separation must take place at the joints; the swaying, with its concomitant pressure and relief, promoted disintegration, and caused the shaft to be still less capable of resisting the recurring wind-pressure. The heavier the material of which a shaft was built, the greater would be its stability, the foundations being good, and the less probability would there be of its swaying. It was frequently stated in treatises on chimney design that the diameter at the base should be one-tenth to one-twelfth the height, but having regard to the paramount importance of width of base, the width obtained by this rule was insufficient; a shaft was instanced 200 ft. high, the outside diameter of which at ground was only 18 ft., giving the chimney an attenuated appearance neither pleasing or suggestive of security. The need for periodical examination of tall chimneys was discussed, and emphasised by reference to the recent disastrous fall of a shaft at Burnley. In conclusion, attention was directed to the danger attending the practice of increasing the height of a shaft in order to obtain more draught. The velocity of gases up the chimney being proportional to the square root of the height, increased duty was better obtained by larger diameter than by greater height. It was therefore advisable to have ample area in designing a chimney, a provision which would obviate the inconveniences often leading to increasing the height, and would result satisfactorily in every particular.

On the motion of Mr. H. Kempster, seconded by Mr. R. W. Newman, a cordial vote of thanks was passed to Mr. Bancroft for his interesting and instructive paper.

Replying to observations made by those and other gentlemen, including Mr. Clark, Mr. A. Marshall, Mr. E. Berry, Mr. W. Wedekind, and the Chairman, Mr. Bancroft said the question of the proper height of a chimney and the amount of duty it would perform was shrouded in some mystery. Very often increased duty had caused a better draught, the chimney having previously been sluggish. That chimneys were not built so high as formerly was a matter of congratulation; it was better to have increased diameter than great height, especially nowadays, when special fittings to boilers could be obtained which enabled small fuel to be burned. As a rule, the disasters which had occurred to chimneys had been caused by wind blowing them over, and this was brought about chiefly, no doubt, by the height being considerable and the diameter rather small. It had been a matter of controversy as to whether chimneys should be built in lime or cement. In his opinion, lime should be used, as cement would not stand excessive heat; it cracked. Chimneys could certainly be built from the inside; in fact, most of large diameter were so constructed. He did not agree with having heavy tops to shafts, because they overhung as a rule, thus catching wind and raising the centre of pressure of the wind; but they also raised the centre of gravity of the whole mass, and when once a chimney, should it rock at all, was set in motion by the wind, both the weight and the increased height caused it to oscillate longer and more slowly, and it was more apt to receive a second gust in the same direction. Wrought-iron shafts were very serviceable in a dry atmosphere, and, if carefully looked after, they might be used with advantage in an English climate, for they had gas-holders and other wrought-iron appliances that stood wear and weather for years; but they must be well looked after. A circular shaft, he considered, was preferable to a square one. Ordinary bricks might be used in round chimneys, when the latter were of considerable diameter; but for those of a very small diameter, radial bricks should be employed.

The meeting then closed.

THE LONDON COUNTY COUNCIL.

THE usual weekly meeting of the London County Council was held on Tuesday at the County Hall, Spring-gardens, Sir Arthur Arnold, Chairman, presiding.

Loan.—On the recommendation of the Finance Committee, it was decided to lend the Chelsea Guardians 4,740*l.* to defray the cost of erecting casual wards, fire escape bridge, and for the extension of the Infirmary.

Breach of Contract.—The Fire Brigade Committee brought up a report stating that their attention had been called by the London Building Trades Federation to the arrangement made for the execution of plumbing work by Messrs. Scharien & Co., who were erecting the new Kennington Fire Station. The Federation stated that they had reason to believe that the plumbing work had been sublet to a working plumber named Allfleck, who carried on a small business, and that no workman who demanded the trade union rate of wages of 10½d. per hour could obtain work from him, the people employed being improvers and boys. Messrs. Scharien's books were inspected, and it was found that Allfleck had been paid 11d. per hour, another man, named Piper, 9½d. and sometimes 10d., and his mate had been paid 4d. and sometimes 4½d., the stipulated rate for plumbers' mates being 6½d. It also appeared that Piper was, during the week ending December 6, 1895, employed six hours overtime without receiving the stipulated rate. In a written explanation on the subject, Messrs. Scharien & Co. stated that Piper, the plumber's improver, had been with them for six years. They took him by arrangement from his widowed mother to teach him the trade of a plumber; they started him at 3d. per hour, which had increased to 10d. now, and by next Easter he would be a full-blown plumber in receipt of 10½d. They considered they had done their duty, and acted most honourably towards him and his mother. With reference to the overtime of six hours not showing on their sheets that he had received time and a quarter, the fact of the case was that each day he worked two hours overtime, out of which he had half-an-hour for tea and which he charged as worked, thus making him time and a quarter without any alteration in the rate. The other two lads were on exactly the same terms; one belonged to their foreman (who had been with them for twenty years). The Committee stated that the Council could under Clause 25 of the contract claim to deduct in respect of the insufficient rates of payment 5*l.* as liquidated damages for each week, and in respect of the hours worked overtime without extra pay 5s. per hour. If the Council decided to exercise its powers, and the contractors disputed its decision, they might appeal to the architect, who by the contract is the sole arbitrator. It would also be possible for the Council, if it thought fit, to determine the contract. They had carefully considered the matter in conference with the solicitor, and, although there have technically been breaches of the contract, they were disposed to think that on the whole the Council would regard the contractors' explanation as reasonable. They therefore recommended:—

"That no action be taken with regard to the breaches by Messrs. Scharien & Co. of the provisions of their contract with respect to the wages paid to men employed on plumbing work at the new Kennington fire-engine station."

Alderman Taylor moved as an amendment:—"That the Council do exercise the power reserved by Clause 25 of the contract of deducting sums in respect of the breaches of contract referred to in the report of the Committee, and that the solicitor be instructed to inform Messrs. Scharien & Co. that such amounts will be deducted." He considered it to be a very flagrant case, and to pass it over would be unfair to the workmen, to the general body of employers, and to the Council, and would lead to endless trouble, because contractors would feel that the Council was not serious in inserting penalty clauses in their contracts.

Alderman N. W. Hubbard, in seconding the amendment, said they must stand by the contract or never again insert a penalty clause.

Colonel Rotton believed the case to be an exceptional one, and appealed to the Council to adopt the Committee's report.

Mr. John Burns, M.P., supported the amendment. Their own solicitor had reported that they could impose penalties in this case, both as to the under-payment and as to the overtime. It was essential that everything should be done to enforce the payment of the contract wages, which meant good workmanship. Some of the fire stations erected under the old régime contained very bad work, and some which were the handiwork of improvers and cheap and nasty plumbers might be described as chambers of horror. If the Council declined in this case to enforce the contract, then they must say good-bye to good sanitary work—which only came from qualified workmen—and to their architect's control over buildings put out to contract.

Lord Carrington, Chairman of the Fire Brigade Committee, hoped the Council would make an example in this case by inflicting the penalties.

Mr. Emden hoped the Council would not agree to the amendment. It was not so much a question of whether the work was done by apprentices, or full-blown plumbers, as whether it was well done, and that it was well done they had heard.

Mr. Roberts hoped the matter would be regarded as one of principle. If they did not impose some nominal penalty, the other contractors who tendered for the work with a full knowledge of, and an intention to adhere to, the conditions, would have a grievance.

Mr. Urquart read a part of the Solicitor's report which Mr. Burns did not refer to, in which the Solicitor said that Messrs. Scharien's explanation seemed to be reasonable.

Mr. Ward held that it would be useless for the Council to insert a schedule of wages if they allowed the employment of improvers.

On a division the amendment was carried by fifty-seven to fifty.

Mr. Bond moved a further amendment, which was adopted, to leave it to the Fire Brigade Committee to determine what the amount of the penalties should be.

The Water Question.—The consideration of the special report on the question of procuring a supplemental water supply from Wales was again postponed.

Boundary-street Improvement Scheme. — On the recommendation of the Public Health and Housing Committee, it was agreed—

"*(a)* That, subject to an estimate being submitted to the Council by the Finance Committee as required by the statute, the work of erecting Block E and workshops in rear, on the area comprised in the Boundary-street improvement scheme, be executed by the Council without the intervention of a contractor, and that the plans, specification, and estimate be referred to the Works Committee for that purpose; but that, in the event of that Committee not being satisfied of the sufficiency of the estimate, the Public Health and Housing Committee be authorised to invite tenders.

(b) That the Solicitor be instructed to apply to the Home Secretary for an order permitting a modification of the Boundary-street improvement scheme, so as to enable the Council to do away with the proposed new street lying to the north-east of the area, and running westwards out of Mount-street."

Christ Church Railway Bridge and Battersea Park-road Widening.—On the recommendation of the Improvements Committee it was agreed:—

"That, subject to a contribution by the Vestry of Battersea of one-fourth of the net cost of the improvement, Parliamentary powers be sought in the Session of 1897 to enable the Council to widen Battersea Park-road between Simpson-street and Home-road, as shown upon the plan approved by the Improvements Committee on February 5, 1896, and in connexion therewith to enable the Council or the West London Extension Railway Company to reconstruct the bridge carrying the railway over Battersea Park-road at Christ Church."

Bridges over North Pole-road and Dalgarno-gardens.—The same Committee also recommended, and it was agreed:—

"That, subject to an estimate being submitted to the Council by the Finance Committee as required by the statute, and subject to a contribution by the Vestry of Hammersmith of half the cost, the Council do arrange for the reconstruction of the bridges carrying the West London Extension Railway over North Pole-road and Dalgarno-gardens, Hammersmith, and that it be referred to the Improvements Committee to take all necessary steps for the execution of the work."

Breach of Contract.—It was agreed, on the recommendation of the Parks and Open Spaces Committee, that the Council do determine the contract with Mr. Godbolt for the erection of the conveniences at Bostall Heath, on the ground that sufficient progress has not been made with the work.

Overhead Tramway Wires.—The Parliamentary Committee recommended the Council to refuse its consent to a provisional order for the erection of overhead tramway wires to the London United Tramways Company.

Earl Russell moved an amendment to refer the report back. He did not think the wires would greatly disfigure the streets, and he held that it was in the interest of the public that the company should be permitted to establish electric tramways.

Mr. Roberts thought it most undesirable, even from the point of cheapness, to deface London thoroughfares in the way proposed. From the point of economy the London, Chatham, and Dover Railway Company were allowed to erect a viaduct at Ludgate Hill, which had disfigured one of the grandest thoroughfares in London.

Mr. J. Burns, M.P., appealed to the Council to reject by a practically unanimous vote this American monstrosity.

On a show of hands the recommendation of the Committee was adopted.

Tribunal of Appeal: remuneration of Members.—The Building Act Committee reported that in accordance with the Council's resolution of

January 21 last, the Secretary of State for the Home Department has decided that the scale of fees fixed at the commencement of the year 1895 for the remuneration for the members of the Tribunal of Appeal shall be continued in force for another year.

Struts in Rosebery-avenue.—On the recommendation of the Corporate Property Committee, it was agreed to remove the struts in Rosebery-avenue, supporting premises belonging to the Council, and projecting upon the footways.

Surrey Commercial Docks Extension.—On the recommendation of the Highways Committee, approval was given to the amended drawings and specification of the hydraulic swing-bridge to be constructed by the Surrey Commercial Docks Company over the communication passage to Canada Dock, under the provisions of the Company's Act of 1894.

The Council's Water Bills.—The Joint Parliamentary and Water Committee reported that the question of the position of the Council's Water Bills had been occupying the attention of a Sub-Committee, and they unanimously recommended:—

"That notice be given of the second reading of the New River, Chelsea, Grand Junction, East London, West Middlesex, and Kent Waterworks (Transfer) Bills, but that the House of Commons be asked to consent to the adjournment of the second reading; and that, in the case of the Southwark and Vauxhall and Lambeth Waterworks (Transfer) Bills, the reference to a Committee of the House of Commons be deferred."

The report was adopted, *nem. con.*

The Council adjourned shortly before seven o'clock.

Illustrations.

THE HORSE GUARDS.

THE Royal Academy last year gave to its students, as one of its subjects for the Silver Medal for measured architectural drawings, the Horse Guards building; a very good selection, as the building is a notable one with a great deal of character about it, and one which has not been illustrated recently, except by views and photographs. Where a building displays, in spite of rather cold and old-fashioned detail, such a satisfactory effect in general composition and detail, it is valuable to have the measured proportions of elevation and projection, so that the student can follow out the method by which the effect of composition was attained.

We publish the principal drawings of the set, by Mr. A. Haswell Christie, for which the Academy medal was awarded; the elevation towards St. James's Park, and the detail drawing of a portion of it. Unfortunately the Horse Guard's authorities could not permit the entry of the students to measure the plan of the building, but Mr. Christie has given the plan of the projections of the Park front, which illustrates at all events the architectural composition of this front. For a similar reason, we presume, it was impossible to measure the Whitehall frontage, as this would have involved interference with the daily functions of the soldiers on duty.

In a recent article (p. 54 *ante*), upon the Banqueting House, Whitehall, to accompany Mr. W. R. Davidson's drawings, we mentioned the various buildings erected by Henry VIII. along the east side of what is now the Horse Guards Parade. The "Tilt" guard, as the infantry guard there is still designated for military purposes, commemorates the old tilt-yard which extended in front of the west side of the present Horse Guards building. In that space were celebrated the jousts, military exercises, and similar displays, so popular in the sixteenth century. It formed the scene of the sumptuous tournament held on January 1, 1581, in honour of the Commissioners, who had come from France with proposals of a marriage between the Queen and the Duke of Anjou, described by Holinshed. It is mentioned by Hentzner, who visited England in 1598, and was the trysting-place of Sir Henry Lee of Ditchling, K.G., George, Earl of Cumberland, Sir Christopher Hatton, and other champions of Elizabeth, who viewed the lists from the gallery overlooking the tilting yard. The gallery is delineated in P. Mazell's print of the Park, with Charles II. and his spaniels, and the old Horse Guards in the background. The print is reproduced in Pennant's "London," being described as "from a painting in the possession of the Earl of Hardwick." The gallery, west of the Holbein or Cockpit Gate, seems to correspond with the "old staircase" marked on Fisher's ground-plan of the Royal Palace at Whitehall, dated 1680. In that plan the staircase projects into the tilting-yard at the south-west corner of the buildings which had been converted into the "Foot Guard House" and the stables of the household cavalry. On the east side of the latter is "Horse Guard Yard" with a gate opening into the street of Whitehall. The Royal Horse Guards, the "Blues," formerly "Oxford Blues," were at one time commanded by Aubrey de Vere, last Earl of Oxford of his house; it had been raised, *temp.* Charles II., as a mounted body-guard for the king. Hence the regiment's original quarters have retained their name to our own day. But, according to Fisher's ground-plan, published by Vertue, the old "Foot Guard House" (immediately opposite the "Palace Gate") occupied the site of the south block of the existing Horse Guards building, the "stables" and "Horse Guard Yard" lying next northwards on the ground covered by the north wing of the Horse Guards, the Paymaster-General's and a small part of the adjoining block of the Admiralty. So the former entrance through "Horse Guard Yard" into the Park lay a little to the north of the present archway, and opposite the central line of Lord Carrington's house, which was pulled down in 1886 * for making Horse Guards Avenue, formerly Whitehall-yard.

Kent, who succeeded Ripley in 1726 as "master-carpenter of all His Majesty's works and buildings," and N. Dubois, in 1735, as "master-mason," designed the Horse Guards, the façade to Whitehall being the design of J. Vardy: the whole was executed between 1742 and 1752.† The famous clock, having two dials, was made by Thwaites in 1756, and the works were coarsely constructed. In 1815-6 the movements and hands were made afresh by B. L. Vulliamy, and again repaired by order of Lord Palmerston when Secretary for War, when it was re-adjusted to show seconds. The escapement is described in Henri Robert's "Etudes sur Diverses Questions d'Horologerie," Paris, 1852. Samuel Scott's view of the Horse Guards Parade was sold in 1887 at the dispersal of the Lonsdale collection. In May last was sold, from the Clifden collection, a view by an artist unknown of the Tilt Yard, showing the stables and barracks built by Charles II., and with a central gateway of red brick, with turret and clock, similar in design to its successor. Of the earlier Horse Guards there also are views in Strype's Stow, 1720 (Kip), and by J. Maurer (1742); one of Canaletti's two views of 1752-3 does not show the cupola.

* No. 8, Whitehall, designed by Chambers. See our views of the staircase and dining-room, August 9, 1884.

† See the "Dictionary of Architecture," and Vardy's drawings. Plans of the ground and principal floors are in J. Woolfe and J. Gandon's *Vitruvius Britannicus*, vol. v., 1771.

THE PRUSSIAN DIET, BERLIN.

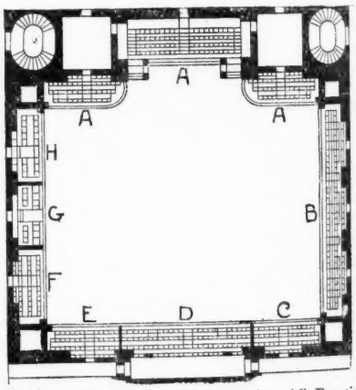
WE have on two occasions described the new Imperial Houses of Parliament in Berlin, and have reproduced illustrations from this building. The new home for the Prussian Houses of Parliament must not be confused with this building, as the legislative bodies of the German Empire as a whole, and the kingdom of Prussia, which is only one of the leading units of the whole, are distinct institutions. As in the case of the Imperial Houses of Parliament, however, the Prussian Institution consists of an Upper House and a Lower House, which are respectively known as the "Herren" House and the "Abgeordneten" House: the latter is, perhaps, better known as the "Diet" or the House of Representatives.

The Prussian Houses of Parliament have practically only existed since 1848, when they were first known simply as the National Congress. This body was first housed in a provisionally-erected building, which had been taken in hand on December 31, 1848, and was completed on February 27, 1849, under enormous difficulties owing to a severe frost. This provisional building, though materially altered and extended since 1848, is yet the home of the Prussian Deputies, and will remain so until the building which we illustrate in this number shall have seen its completion. The alteration of the provisional building commenced with some alterations in 1859, and in 1867 it was thoroughly overhauled, owing to the necessity of providing better accommodation for the gradually increasing number of members. In 1872, 1874, and 1875 further changes were made in the structure, including the introduction of improved heating apparatus. It was not until 1882 that the building of a new structure was seriously considered. The difficulty of obtaining a suitable site was not overcome until many years had elapsed, the ground taken up by the old home of the Imperial Parliament finally being given for the purpose. Numerous designs were made and a kind of limited competition was held with a view of obtaining a suitable scheme, official architects, however, only being invited. Herr Friedrich Schultze was finally entrusted with the commission; but his designs had to be materially altered to suit the constantly changing requirements of the various building committees and official bodies entrusted with the superintendence of the erection. It was not until 1890 that the design was finally decided upon, and then again delays occurred until 1892, owing to the large number of details which were required by the authorities before deciding on the system of warming and ventilation which were to be employed in the new Council Chambers.

The design, as we now find it, has been planned for a rectangular site of considerable depth, with a main frontage to the Leipziger Strauss, which is a main thoroughfare, and another frontage at the other extremity towards the Prinz Albrecht Strasse, which is a new thoroughfare containing various museums, such as the Ethnological Collection and the Berlin "South Kensington" Museum. The grouping is such that the Upper House has its front overlooking the Leipziger Strasse, and is flanked on either side by the official residences of the President of the Upper House and the President of the Lower House respectively, a kind of *cour d'honneur* being formed within the three sides of the square. The Diet practically takes up the whole of the frontage towards the Prinz Albrecht Strasse. The Upper and Lower Houses are connected from back to back by a long passage, in the middle of which there is a small block containing the chambers of the Prussian Ministers and a small committee-room for the Cabinet Council. The space which has not been covered over has been laid out as gardens, room having also been found for a central machinery station, from which ducts have been laid containing the heating and lighting services.

Actual building operations commenced in 1893; the building was roofed in by 1895; and its completion is promised for 1897; the residences for the Presidents above referred to, and the whole of the Upper Chamber will be then taken in hand, and its completion is arranged for by 1900.

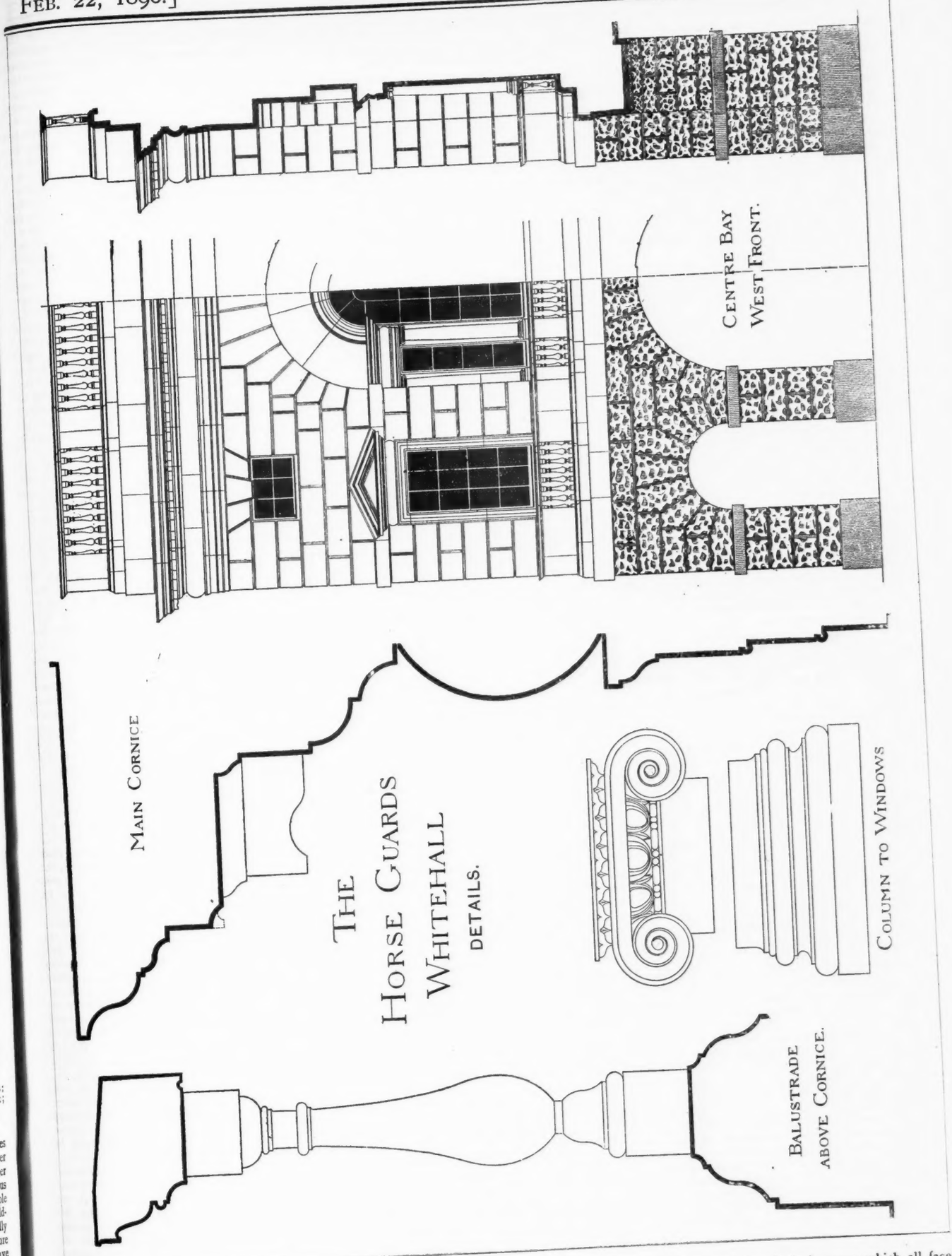
The block of which illustrations are given in the present number, is that for the Prussian Diet, the frontage of which is about 90 mètres or 300 ft. The general arrangement is sufficiently shown on the plans. The arrangement of the plan is plain and straightforward, and the corridors are exceedingly well-lighted. The annexed plan gives the arrangement of the galleries in the upper portion of the Council Chamber, and the manner in which the space in them is apportioned to various classes of hearers. For once we find ample lavatory accommodation in a foreign public building of this description, and there are actually dressing-rooms, hitherto an unheard of feature abroad. It may be noted that the lavatories have been kept quite separate from the water-closets. The Committee-rooms have the advantage of being easily extended or reduced in size according to circumstances, with the aid of shutters, &c. By this arrangement two Committee-rooms can be so enlarged as to seat 150 deputies at a time, whilst the same Committee-room can be reduced to hold small parties of from thirty to fifty.



(*a*) Public; (*b*) Press; (*c*) Reserved; (*d*) Deputies; (*e*) Upper House; (*f*) Ministry; (*g*) Court; (*h*) Diplomatists.

Plan of Galleries to Council Chamber.

Particulars as regards cost are not forthcoming. In regard to the architectural treatment it may be said that in this case Italian Renaissance of the so-called German school has been used with better effect than usual. There is a certain dignity and simplicity about the building which in every



way agrees with the old Prussian tradition of economy and strength.

Stone is being used for all conspicuous parts of the buildings, but brick with stone facings is employed in the courtyards. There is not so much sculptural decoration in the building as we are accustomed to see in Prussian structures, but such as there is we are glad to see is above the average quality, and is not overdone with military emblems, as in the Imperial Houses of Parliament. We should add that we are indebted for our illustrations to the courtesy of Herr Schultze, who has also kindly sent us over working drawings, for which we regret we are unable to find space.

DESIGN FOR A SUBURBAN HOUSE.

THIS house is intended to be built in the neighbourhood of London, and the object aimed at in designing it was to obtain the accommodation required on as limited a ground-plan as possible. With this idea in view, the library has been placed on the first-floor, and the size of the attics has been increased by carrying up into them the bays of the principal rooms, which all face south.

An attempt has been made to give interest to the entrance by the contrivance of a small octagonal hall, while there is ample room for hats, coats, and such like below the first flight of the front stairs. There is also a back-stair as far as the first-floor.

The materials are red brick, with rough-cast walls above the ground-floor, and a tiled-roof; the estimated cost is about 1,700*l*.

AMBROSE M. POYNTER.

COMPETITIONS.

CHURCH, EXETER.—In the recent limited competition for the new Church of St. David, Exeter, Mr. James Brooks being assessor, the design submitted by Mr. W. D. Caröe, F.S.A., has been selected, being stated by the assessor to "far excel the others in merit." The church will provide for 800 sittings at a cost of 12,000*l.*, exclusive of fittings, but inclusive of a lofty tower. The other competitors were Messrs. Tait & Harvey, Mr. Fellowes Prynne, Mr. Harbottle Reid, and Mr. Jerman.

CONSERVATIVE CLUB BUILDINGS, HINDLEY.—The result of the competition for the Hindley Conservative Club buildings is as follows:—1st premiated design, Mr. T. A. Buttery, architect and surveyor, Exchange-buildings, Queen-street, Morley; 2nd premiated design, by Messrs. Horrocks & Lomax, architects and surveyors, 25, Athol-street, Douglas, Isle of Man.

WEST CLAYTON-STREET CONGREGATIONAL CHURCH, NEWCASTLE-ON-TYNE.—Twenty-six sets of plans were received in this competition. The assessor, Mr. James Cubitt, of Broad-street Buildings, E.C., awarded the first premium to the design marked "Corner Stone," by Mr. G. W. Ward; the second to that marked "Lough Model," by Messrs. Marshall & Dick; and the third to that marked "Parkholme," by Mr. Stephen Piper, all of Newcastle.

ARCHITECTURAL SOCIETIES.

ARCHITECTURAL ASSOCIATION.—DISCUSSION SECTION.—The eighth meeting of the Session of this Section of the Architectural Association was held on the 19th inst., Mr. Herbert A. Satchell in the chair. Mr. H. R. Appelbee read a paper on "Conditions of Architectural Competitions." In the course of his paper he argued that just as the combined action of architects had at last been successful in getting a professional assessor appointed in almost all competitions so it might be the means of effecting further necessary reforms. These are the abolition of all unnecessary restrictions, a greater compatibility between the desired accommodation and the limit of cost than is usual, and if possible the substitution of a jury for the single assessor. He would like to see such powerful testimony brought to bear on the verdict that a committee would have no option but to accept it. He looked forward to a "Legion of Honour" among architects the members of which would act voluntarily in these matters for the honour and advancement of their art. Mr. Cooksey (of Messrs. Cooksey & Cox) in proposing a vote of thanks, related their unfortunate experiences at Durham; and went on to say that he thought it the duty of the Institute to deal summarily with any of its members who openly violated the rules of a competition as to canvassing, &c. He would like to see the Competitions Committee of the Royal Institute of British Architects voluntarily assess all competitions, and that all members should undertake not to compete in any competition they did not approve of. In the course of the discussion Mr. Jemmett observed that in France the jury were selected by the competitors, and the result was usually satisfactory. Mr. H. T. Hare thought the best results were obtained by competition, but that too much stress was often laid on strict compliance with conditions; the object should be to produce the best building.*

BIRMINGHAM ARCHITECTURAL ASSOCIATION.—The eighth general meeting of the session of this Association was held on Friday evening last week, when Mr. Arthur Dixon, M.A., read a paper on the subject of "Ancient and Modern Building." He said the question he proposed to consider was how it has come about that ancient towns and cottages are always delightful and full of beauty, while modern towns are on the whole ugly and uninteresting? After referring to certain disadvantages peculiar to modern times, such as smoke and other fumes and inconvenient by-laws, he referred to the difficulties caused by the invention in modern times of cheap and mechanical methods of preparing materials, and he instanced especially the thin, smooth, and regular Welsh slates and the ill-proportioned bricks which are principally in use in the Midland counties. Undue thinness in slates and undue thickness in bricks both conduce to cheapness of construction, and this discovery having been made, it becomes almost impossible in the cheaper and larger class of buildings to avoid its results. Mr. Dixon said he believed, however, that the principal difficulty of modern times lay in the change of system under which building is carried on. In the old days architect, builder, mason, and carpenter worked in intimate and more or less permanent relationship. Consequently every workman took an intelligent and personal interest in the work upon which he was engaged, and every stone and every piece of timber, as well as the general form and shape of the building, was full of life and interest. Nowadays a workman is continually changing his master and his style; he loses his own personality, and becomes little more than an admirable but soulless machine. These remarks apply especially to ornamentation and decoration, which the lecturer considered we had better do without for the present, except when we are able to put it in the hands of a man of real and untrammelled imagination.

EDINBURGH ARCHITECTURAL ASSOCIATION.—About seventy members of this Association, under the leadership of Dr. Rowand Anderson, President, and Mr. T. Fairbairn, Secretary, on Saturday last week, took part in one of the usual fortnightly excursions. The first place visited was the Electric Lighting Station, Dewar-place, by permission of the Lord Provost and Magistrates. The party were received by Mr. C. W. Monkhouse, C.E., who, after being introduced by Dr. Anderson, conducted them through the building and explained the plant and machinery. The party, having inspected the premises in which the electric light was produced, next proceeded to view its applications in the mansions, Nos. 11 and 28, Drumsheugh Gardens, kindly thrown open by Mr. William John Dundas, C.S., and Mr. Ralph Dundas, C.S., respectively. These gentlemen welcomed the visitors, and explained the objects of interest. The wiring and fittings in both houses were designed and superintended by Professor Forbes, of London.

CARLISLE ARCHITECTURAL, ENGINEERING AND SURVEYING SOCIETY.—At a meeting of this society, held on the 18th inst., in the Town Hall, Carlisle, Mr. P. F. Ruthven (of Messrs. Cowans Sheldons) read a paper on "The Utilization of Water Power," as exemplified in the "Niagara Scheme." He then described the scheme of side channel and turbines, which has previously been described in our columns. He mentioned that a special device was arranged in the dynamos of putting the revolving portion on the outside instead of the inside, as is customary. The cost of supplying the electricity was only one-eighth of a penny per Board of Trade unit as against sixpence in this country, when generated by means of coal.

GLASGOW ARCHITECTURAL ASSOCIATION.—A meeting of this Association was held in the rooms, 187, Pitt-street, on Tuesday evening, Mr. A. N. Paterson, M.A., President, in the chair, when a lecture was delivered by Mr. T. L. Watson, F.R.I.B.A., President of the Glasgow Institute of Architects, on "Glasgow Cathedral; a Contribution to the History of the Structure." He said it was not inferior in beauty to any Continental cathedral. Entering into a historical review of the building, he described in detail the various mouldings, plans, &c., and also the method likely to have been employed in building the structure. The vaulting of the crypt, he said, was its chief glory, and he gave an elaborate description of the plan adopted and the difficulties overcome. The lecture was illustrated by diagrams and also lantern-slides.

GLASGOW AND WEST OF SCOTLAND TECHNICAL COLLEGE ARCHITECTURAL CLASSES.—The second visit this spring of the students attending these classes took place on Saturday afternoon last week to the Botanic Gardens Railway Station buildings, Great Western-road. The architect, Mr. James Miller, I.A., personally conducted the large party through the various rooms and then round the building externally, finally showing and explaining to the students the drawings from which the buildings had been erected. Professor Gourlay, in proposing a vote of thanks to Mr. Miller for his kindness, referred to the architectural beauty of the structure, to the technical excellence of the workmanship, and solid nature of the construction throughout, on account of which the visit had been a most instructive one.

ENGINEERING SOCIETIES.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.—On the 15th inst. this Society visited the Power Station of the London Tramway Company's Brixton Hill and Streatham new cable tramway, and the Pumping Station of the Lambeth Waterworks Company on Brixton Hill. At the first of these places members were taken over the works by the Resident Engineer, Mr. Downie, and were shown the pair of 600 horse-power engines and the driving-gear for working the cables. This gear consists of, among other things, a 30 ft. diameter grooved pulley driven by hempen ropes. The various arrangements for taking up the slack of the cable due to expansion and contraction (caused by the varying temperatures of the air, and to the stretching which takes place in the case of new cables), together with the various guides and gripping apparatus for the cars, and the method of braking both the motor cars and passenger cars were seen by, and fully explained to, the members. The method of splicing, and the general construction of the cables, and the life of them was clearly set before those that were present. At the Lambeth Pumping Station various types of engines were exhibited to the party and explained by the Resident Engineer of the station. The pumps and pumping-engines varied considerably in type, some being of the Worthington, and others of various forms of the beam type of pumping-engine. The visit was also interesting from the number of types of boiler, firebars, and other details in connexion therewith that were seen. A cordial vote of thanks was accorded to those who had invited the Society, and to their representatives.

THE INSTITUTION OF CIVIL ENGINEERS.—At the ordinary meeting of this Institution on the 18th inst., Sir Benjamin Baker, K.C.M.G., the President, in the chair, the paper read was on "The Electric Street-Railway System of Montreal, Canada," by Mr. G. C. Cuningham, M.Inst.C.E. The author traced the rapid development in Canada and the United States of the application of electricity to street railways. In the United States in 1888 there were about twenty electrical roads in operation, having a total of eighty miles of track, and working ninety motor-cars, while there were now 10,363 miles of track, on which were operated over 40,000 motor-cars. While this had been the progress in the United States, Canada had not been slow to adopt a system that was manifestly so convenient for the public. Montreal, Toronto, Hamilton, Ottawa, Winnipeg, Brantford, Niagara Falls, and other places had their electric systems either complete or in process of construction. Almost all the lines were constructed on the overhead trolley-wire system. In Montreal the electric street-railways comprised 74 miles of single line, laid on 41½ miles of streets. A daily service of 140 motor-cars, and about 50 trail-cars was now running. The gradients were in many cases very severe. On the streets running at right angles to the St. Lawrence River there was a continuous rise in most instances, and short sections had gradients of 1 in 10, and even 1 in 8. These gradients were a severe test for the motor-cars, but they were overcome successfully, and caused little difficulty. The ordinary rail adopted was $6\frac{9}{16}$ in. in height, and weighed 72 lbs. per yard. The rails were laid on a foundation of concrete, or imbedded in it, according as block pavement or asphalte was used for the roads. The rails were constructed in complete electrical continuity, and where they passed the power-station they were directly connected by copper wiring to the generators. Bond-wires were riveted into the web at each joint. To still further improve the return circuit, track return-wires of the same size, 0·460 in. in diameter, as the line feeders, were riveted into the web at various points and carried back to the generators directly by overhead insulated copper wires. At first earth returns had been used, the rails being connected by copper wire to cast-iron car-wheels buried between 7 ft. and 8 ft. in the soil; but considerable electrolytic action was found to be set up between the earth and gas or water-pipes. It was determined not to use the ground for this purpose and to construct a complete metallic return. The trolley-wire used throughout the system was of bare copper, 0·365 in. in diameter, carrying a safe current of about 440 amperes. It was suspended from poles between 110 ft. and 120 ft. apart at the curb line on either side of the street, at a height of between 18 ft. and 20 ft. over the centre of each track. In some instances the trolley-wire was carried by a central line of posts placed between the double tracks. The current had been at first supplied to the trolley-wires connected in one continuous system; but this was now divided into various independent sections so that trouble on any one was felt there only, and did not affect the others. Each section was fed directly from the power-station by

* We do not see how a competition is to be conducted with fairness to all except on the basis of clearly defined conditions which all must observe.—ED.

feed-wires, and had its own system of return-wires. The feed-wire and return-wire mostly used was 0·460 inch in diameter, but within a three-quarter mile radius of the power-station heavier insulated cables were inserted, about 1 in. in diameter, carrying a safe current of about 600 amperes. Ten such wires led from the power-station, and ten others of same size acted as return-wires, allowing for a total output from the power-station of 6,000 amperes. The difference of potential maintained at the generators was 550 volts. The boiler-house and engine-room were placed fairly centrally to the system, and near to the Lachine Canal whence water was obtained for condensing purposes, and to the coal wharves. There were fifteen Lancashire boilers, each 28 ft. long by 7 ft. in diameter, with double furnaces. They developed each 300 h.p., and carried a working-pressure of 125 lbs. per square inch. The engine- and dynamo-room was 235 ft. long by 89 ft. wide. There were six horizontal cross compound condensing-engines developing 600 h.p. each, with a boiler-pressure of 125 lbs. per square inch. The cylinders were 24 in. and 48 in. in diameter, and steam-jacketed, with Corliss valves. Each of the first three engines drove four Edison generators, developing 200 kilowatts a-piece. The driving-wheels were double-crowned, and carried two pairs of belts, driving 41-in. pulleys, fixed on the armature-shaft of the generator. The three remaining engines drove each a pair of multipolar generators by one 52-in. belt on one pulley, 48 in. in diameter. The two generators were mounted on the same bed-plate, with the pulley between them. The armature-shaft and the pulley-shaft were in alignment, and were connected by two friction-clutches. By this means the generators could be driven together or separately. The generators were supported on a continuous length of foundation-wall built in brick and cement, and sufficiently massive to be free from vibration. The rolling-stock equipment in the summer amounted to 163 motor cars; in winter it was 145 closed cars with double motors, and 14 snow-sweepers with triple motors. There were besides, 53 open trail-cars and 60 closed trail-cars belonging to the former horse-system. The motors developed 25 h.p. or 30 h.p. each, and were all of the single reduction type, the ratio of the pinion to the gear-wheel being generally about 4 to 1. The average speed of the cars was about 7½ miles per hour. Electric snow-sweepers, 18 ft. long, carried on two pairs of 33-in. wheels, were used. To each axle was geared a 30-h.p. motor, a third motor being placed in the car to drive the rotatory brooms.

Correspondence.

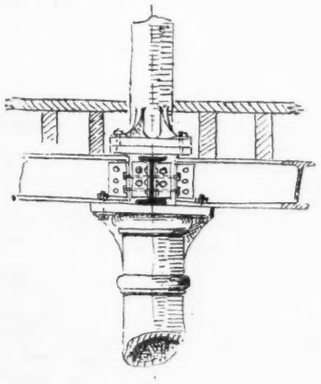
To the Editor of THE BUILDER.

CO-EFFICIENTS FOR IRON-BEAMS.

SIR,—In your issue dated 1st inst., and under heading of "Notes," after referring to my list of co-efficients for H beams, you draw attention to the manner in which manufacturers' lists of safe distributed loads are compiled.

You draw special attention to these lists being calculated with ends of the beams "fixed"; and though this is mentioned on the lists themselves, I have known serious blunders to be made through insufficient importance being attached to this expression.

You stated that "fixed" ends are "seldom if ever resorted to." Ironwork now plays a prominent part in construction, and many cases are continually coming before us in which, I think, the ends may be correctly stated as firmly fixed.



For instance, in flooring, with the ends of beams prepared with double angle-knees riveted on, and bolted through square shaft of column, as shown in enclosed sketch.

In many other details of constructional ironwork fixed ends occur, and the manufacturers' lists may then safely be used.

At the same time, a beam built into a wall cannot always, if ever, be stated as "firmly fixed," and in many other cases, as you remarked, "those not accustomed to engineering parlance are liable to be misled."

To such it may be useful to know how to use these lists, for beams *supported* at their ends.

The strength of a beam with fixed ends, compared with a similar beam with supported ends, is as 3 is to 2; therefore, two-thirds of the safe load for the former gives us the safe load for the latter.

You also remark that some of these lists imply too much confidence in the strength of iron and steel.

Seddon gives us the following formula for safe distributed load in tons for an H-iron beam when ends are *supported*:—$\cdot 52\,(w - 0\cdot 3bd)\frac{d}{L}$.

A 10 in. by 5 in. by 5 in. H-iron beam by 36 lbs. per foot run, and spanning 18 ft., would therefore be expressed thus:—$\cdot 52\,(36 - 0\cdot 3 \times 5 \times 10)\frac{10}{18}$, which equals 6 tons.

A list I have before me gives for same beam a safe distributed load of 8 tons for *fixed* ends, and, taking two-thirds as previously mentioned, we have $\frac{8 \times 2}{3}$, which equals, say, 5⅓ tons, if ends are *supported*.

This, compared with the calculated 6 tons, shows the manufacturer to be on the safe side.

For beams where circumstances do not necessitate elaborate calculation, if their figures are approximate with the result of formula I have given, I think these lists may be relied upon.

The only drawback with them is their being confined to distributed loading, and this I have endeavoured to overcome in the list of co-efficients so kindly noticed by you.

KENDRICK EDWARDS.

*** We agree that the construction sketched by Mr. Edwards may be defined as "fixed ends."—ED.

SEA-WATER FOR WATERING ROADS.

SIR,—I was interested to note the observations on page 68 of your issue of 25th ult., and regret I have not since had time to write you respecting this very important question. In this island sea-water was used for many years for watering roads, with most ill effects. True the material used for road-making in the island was then principally a hard limestone, which is still used very considerably here. The result of watering this with sea-water was that, of course, the moisture placed upon the roads soaked into the ground, or was evaporated again by the sun, leaving behind in the macadam, in either instance, a very considerable quantity of salt, which, with the least moisture, either from fogs or other causes, very considerably aggravated the muddy and slushy condition of the roads. And this was also a very serious fault during a thaw after a frost, when the whole road as far down as the salt seemed to have penetrated was more or less disintegrated.

Some of our roads here, having to bear the heaviest traffic, are metalled with Guernsey granite, and the watering of these with sea-water, in my opinion, causes the roads (when at all hilly) to become unusually slippery, and this is the experience of several engineers to whom I have spoken upon the subject. And in my opinion, no matter of what material the roads are made, the soaking of sea-water into the roads must have at least some prejudicial effect upon the growth of the majority of trees planted by the road-side.

To a very considerable extent sea-water may be found to be advantageous over fresh-water for all-round watering purposes, but it has its faults, and the general result of some years' experience in this island is that sea-water for road-watering purposes has now been abandoned, although we have an abundance of it, and fresh-water, for which we have to pay, and which is rather a scarce commodity in the island, is used in its stead.

Isle of Portland. F. J. BARNES.

ASSOCIATION OF MUNICIPAL AND SANITARY ENGINEERS.

SIR,—As an intending candidate for the examination held by the Association of Municipal and Sanitary Engineers, I procured a syllabus of examinations, with the questions given at the examination held last October, and am somewhat surprised to note the questions under the subject "Engineering as Applied to Municipal Work."

According to the syllabus issued by the Association, this subject will embrace questions on

a. Land Surveying and Levelling.
b. Hydraulics.
c. Drainage and Sewerage.
d. Water Supply.
e. Road-making.

Now, of the six questions in the examination-paper for last October, only one question on sewage disposal could be said legitimately to come under one of these five headings—while three questions related to engines, machinery, electricity, &c.—subjects not mentioned in the syllabus.

However necessary and desirable it may be for a Municipal Engineer to have a knowledge of machinery and electricity, I think it scarcely fair that questions on these special subjects should be sprung on candidates without notice; and, if the Association mean to test the knowledge of candidates on these subjects, they ought to make it clear in their syllabus.

So far as my experience goes, a Corporation rarely, if ever, call on their Engineer to carry out any special work, such as electric lighting. It is usual, I believe, to entrust such work to someone having special knowledge of that particular branch of engineering. A. B. W.

WAR DEPARTMENT CONTRACTS.

SIR,—I have noticed with pleasure the strong feeling which has lately manifested itself in certain technical and other papers against that singular combination known as the Royal Engineer Establishment, under which our barracks and other works of the War Department are erected, and, believe me, Sir, there is very strong foundation indeed for the grave charges which have been forcibly imputed against the self-glorifying creed of the Royal Engineers. In your issue of September 7 last, page 167, you commented severely on the insanitary state of Aldershot Camp and the bad condition of other barracks, but this is only one of the evils arising from the employment of military officers on civil works of this sort, who, at the best, are but the veriest tyros in building construction and design.

My object, however, in sending you this communication, is to point out the extraordinary system under which the work of the War Department is carried out, and how it affects builders and the building trades. I refer more particularly to the method known as triennial contracts. Every three years builders are invited to tender for the execution of the works in a military district, which works shall not exceed 400*l.* each, and the contract to last three years. These tenders are based on a Schedule of Prices, at a certain percentage on or off this schedule. So far, so good; but it is when you become a War Department contractor the worry starts.

The builder, instead of getting a copy of the quantities, or "detailed estimate," as it is called, receives a strange document (Army Form, K 1,261), as his "contractor's order" for the execution of the work. On this form, only the length, breadth, depth, and number of the dimensions of each item are shown. The measurements are not squared, neither are the prices given nor monied out. This is practically useless to the builder, who usually ignores this "order" puzzle, and relies on the plan alone.

As soon as the job is completed still stranger proceedings occur. The work is then conjointly and wholly measured up by a Government representative and the contractor, as if no detailed estimate or bill of quantities had ever been made! What are quantities for, I should like to know, except to *avoid* the measurement of work *in toto* on completion. These two persons, after inserting their dimensions in measurement-books, then proceed to abstract them into abstract forms, which approximate to a bill of quantities of the work as finally executed. The "abstracts" are then transformed into "bills," which, to all intents and purposes, are simply copies of the abstracts. I never knew a contractor yet who could make out his own bills, so complicated are they, but the difficulty is evaded by getting the military foremen of works or clerks to do it for him—for a consideration, of course—thus defrauding him of his due.

Now, why all this nonsense? Why not abolish these silly orders, abstracts, and bills, and give the poor contractor a proper copy of the detailed estimate in the first instance, confining the measurements to the extras and deductions alone, as they occur during the progress of the works, and adding or deducting these from the original detailed estimates? The builder, then, to get a simple certificate to the effect that he is entitled to so much money as payment for certain work executed, and on presenting this certificate to the paymaster he would get his cheque. This, of course, is nothing more or less than the system of architects' certificates, used in every architect's office—a plan which is simple and effective. It is useless dealing with the engineer officers, for they are almost entirely ignorant of technical knowledge and procedure, and the civilian surveyors, who bitterly complain of this and other foolishness, are not allowed to interfere. But the ways of the Royal Engineer establishment are incomprehensible, and its methods are indeed peculiar, and worse than any Chinese system. What an immense amount of labour and worry would be saved to everybody concerned were some sensible means of dealing with technical work devised, approaching as closely as possible to that in civil life. I write as one who has suffered in the past, and in the hope that some improvement may speedily take place now that the army at last has an energetic and reforming Commander-in-Chief.—Yours, &c.,

A BUILDER.

The Student's Column.

CARPENTRY AND JOINERY.—VII.

BRIDGES.

THE oldest Roman wooden bridge of which we have any record is that of Sublicius (from sublica, a pile), built about 600 B.C., in the reign of Ancus Martius. This was the bridge, according to Polybius, that Horatius Coccles defended with so much valour against the army of Lars Porsena. Fig. 81 represents the supposed section of the celebrated bridge designed by Julius Cæsar to span the Rhine, and so quickly was it built that within ten days of the commencement of its erection his army had crossed it. The inclined struts supported the bridge against the force of the stream. Trajan's bridge over the Danube is represented in Fig. 82, which is copied from a bas-relief on the Triumphal Column erected to him in his Forum at Rome. Each arch was 100 ft. in the clear, and it will be noticed that its ingenious and pleasing design is eminently suited to such a structure.

Though at the present time bridges of large span are usually built of stone or steel, still in some cases, owing to financial or other reasons, the carpenter is called upon to erect an artificial elevated way in timber between two points separated by an intervening depression. In America, for example, there are few railways that have not, at some point on their permanent way, trestle-bridges formed of timber (fig. 83) spanning ravines; though from the oft-repeated news of their collapse, they seem perhaps somewhat out of place in railway construction. These calamities could, no doubt, be prevented by periodical inspections, and by spending a little more care and forethought on their maintenance. A committee, appointed by the Association of Railway Superintendents of Bridges and Buildings of the United States have just issued their report which, however, throws little fresh light on the subject, but recommends that more attention be given to the compressive bearing resistance of timber across the grain, owing to the liability of heavy stresses to indent the timbers and thereby destroy the fibres, increasing the tendency to speedy decay.

The first point to be considered in the construction of a bridge is that sound and well-seasoned timber only be used, and that it is in sufficiently large scantlings, which must be well jointed together. In the event of spanning water care must be taken to calculate for the rapidity of the flow of the river, not only in its normal state but as likely to be increased by floods. An important consideration in designing bridges is to obtain the best situation having regard to local requirements and traffic, care being taken that there is sufficient means of access; further, it is always desirable to cross the stream at right angles if it is possible to do so. In crossing water a single span should, if possible, be used, because in the history of wooden bridges a far larger number are destroyed by the water beneath and by ice-floes, &c., than by weight exerted on its traffic surface.

Single spans can generally be constructed up to about 350 ft. or even 400 ft. No bridge is more satisfactory than a curved rib bridge in one span, and none can be stronger, for if well made it is more firm than a single piece of large dimensions, provided that the wood is well selected and the direction of the grain is so arranged in the framing that the parts strengthen and support one another. The following table may prove useful to the student.

Table of the least rise for different Spans (Tredgold).

Span in Feet.	Least rise in Feet.	Span in Feet.	Least rise in Feet.
30	0·5	180	11
40	0·8	200	12
50	1·4	220	14
60	2	240	17
70	2½	260	20
80	3	280	24
90	4	300	28
100	5	320	32
120	7	350	39
140	8	380	47
160	10	400	53

The settlement of wooden bridges is generally taken as about 1 in 72.

Piers, for supporting bridges in cases where the river is not too deep or the current too strong, are made by driving in a single row of piles parallel to the current of the stream. These piles should be about 12 in. square and some 3 ft. apart. Fig. 100 is an illustration of a pier on this principle. When, however, greater strength is needed, there should be a double row of piles, well braced together.

In constructing a bridge over the Severn, near Shrewsbury, Telford adopted a very successful method. He constructed piers consisting of an upright timber frame, with horizontal grated-framing attached, which formed its base. The framing was then sunk to its proper position on a level bed and short piles were driven through the framed-grating to keep it secure, the lower portion being filled with gravel and small stones, kept in their place by planking. Piles should have their lower end brought to a point and shod with iron, and should be provided with a hoop at the upper end to prevent any tendency to split from the blows of the *monkey*. In cases where more than one row of piles is used, it is usual to protect them by *sterlings*, which are simplest when composed of two rows of piles, converging to a point or cut-water. These piles are driven so that the point (on plan) is placed, like a wedge, against the stream, and the whole of the face is generally protected by iron to resist the force of ice-floes or other floating material.

TYPES OF WOODEN BRIDGES.

We may roughly divide bridges into five classes:—

I.—*Flat lintel and cambered lintel.*
II.—*The braced lintel.*
III.—*Trussed girder bridges.*
IV.—*Suspension bridges.*
V.—*Curved rib bridges.*

I.—*The flat lintel* is obviously the simplest form of timber bridge, and may be strengthened by making it deeper in the middle than at the ends. The best form of *cambered lintel* is that shown in fig. 88, which may be composed in two pieces, or have several bolted together.

In the former case, the lower one may be of a rectangular shape, the upper one tapering from the centre to both abutments.

II.—*The braced lintel* is the next modification from the flat lintel, and generally consists of the introduction of struts or braces below the level of the roadway. In the Middle Ages, when wooden bridges had to be formed over the principal rivers to connect the highways, they were generally constructed on this principle, with piers about 20 ft. apart, consisting of one or more rows of piles, protected by a kind of *jetta*. In rivers which were tranquil and not liable to high and rapid floods the augmentation of the piers did not so much signify, provided it did not unduly contract the flow of the river or interrupt the navigation, and at the present day there are many cases where similar but lighter wooden bridges may be used with much advantage, especially where the piers can be kept of slight dimensions. The Mediæval bridge-builder, however, often paid no regard to floods or currents, and consequently his numerous piers would collect the floating *débris* and become unable to withstand the pressure of water in time of high floods.

The bridge over the Brenta by Palladio (fig. 86) is a good example of the application of this principle, and, where practicable to erect a bridge of this kind, it would be difficult to find a more simple and effective method.

III.—*The trussed girder bridges* were much in favour with Palladio, who was amongst the first of modern architects to attempt to design bridges which did not require numerous piers in their construction. The celebrated bridge over the Cismone, near Bassano (fig. 87), was one of the best efforts of this architect, assisted by an able carpenter named Martino; its span is 108 ft. The transverse girders below, which are strapped up to the trusses and form the roadway, are 12 in. by 12 in., and the trusses are formed out of 12 in. by 9 in., and themselves form the parapet. It will be noticed that the construction assumes the form of the familiar queen-post roof-truss, a form which is eminently suited to bridge-building. Fig. 89 represents the centre bay of the foot-bridge designed by Peter Nicholson to cross the Clyde at Glasgow in the year 1858. It was specially designed with a view of admitting a certain class of vessels to pass beneath it. A clear span of 42 ft. was considered sufficient, making nine bays in all. It will be seen that a queen-post truss, formed as a railing, spanned from pier to pier. The breadth of the footway is about 8 ft., and the land abutments are strong masses of masonry. It will be noticed that each point has a lintel between it and the tie-beam of the truss, which tapers off towards the centre of the bay, thus assisting the stability of the bridge on the cantilever principle. The form of the footway is a flat parabolic curve. This bridge met with the approval of Rennie and Telford on account of its simplicity, strength, and appropriateness for its intended purpose. The railway bridge at Richmond in the United States, which is 2,900 ft. long, and is formed in spans of 150 ft., consists simply of two latticed girders 10 ft. deep, braced together with short transverse beams, on the upper surface of which are placed the railway lines. Figures 84, 85 represent a similar lattice girder bridge invented by Ithiel Town. It is suitable for spans up to 150 ft., and is much used on American railways, one great advantage being that only small scantlings are required in its construction. The lattice is formed of fir planks about 12 in. by 3 in., connected at their intersection by 1½ in. oak pegs. The depth of the lattice is generally about one-ninth of its span. The two ribs under each side of the permanent way are stiffened by cross timbers about 12 ft. apart, diagonal braces being inserted below. Stone abutments for these bridges find favour with the American engineer. The economy of this system is evidenced by the fact that the railway bridge at Richmond, United States, cost only between 8*l.* and 9*l.* per lineal foot for its construction, and it is 60 ft. above the water.

IV.—*Timber suspension bridges* are not in general use, and can be recommended only in very exceptional cases. Fig. 90 shows a simple yet ingenious method, which has been used with some success.

V.—*Curved-rib bridges* are suitable for large spans, and especially in places where, owing to the rapidity of the current, or liability of danger to piers, through floating masses or sudden and strong floods, one span is found desirable.

The radius of curvature of any bridge without horizontal ties should be equal to one-fifth of the height of a column, 1 in. square, of the material of which the bridge is composed, whose weight would crush 1 square inch of such material. For example, it has been found by experiment that a square inch of oak crushes at 5,147 lbs. One-fifth of this weight of oak in a column 1 in. square would be 2,950 ft. high. Consequently, the radius of curvature in an oak bridge should not exceed 2,950 ft., and, in the case of fir, 3,000 ft. should be the limit.

In a bridge with horizontal ties of timber, the bridge being, generally speaking, at least double the weight of the foregoing, the radius of curvature must necessarily be smaller, and is usually taken at half the above radii, viz., 1,475 for oak, and 1,500 ft. for fir. This, however, is without taking the weight of the roadway into consideration, which adds to the weight of the structure, but does not contribute to its support. This fact will vary the radius already determined, and may be found by the following formula:—

W = whole weight of bridge.
w = weight of support (frame only).
r = radius of curvature already determined.
θ = the final constructive radius required.

$$\theta = \frac{w \times r}{W}.$$

To find the sectional area at the crown for each rib of a curved-rib bridge, let

β = sectional area in inches.
S = span in feet.
W = gross distributed load in lbs.
n = number of ribs.
R = rise in feet.

$$\text{Then } \beta = \frac{S \times W}{8{,}000\ R \times n}.$$

For example, to find the sectional area of each rib at the crown of a bridge of 100 ft. span, and 10 ft. rise, capable of supposting a load of 300,000 lbs, the curved ribs being three in number.

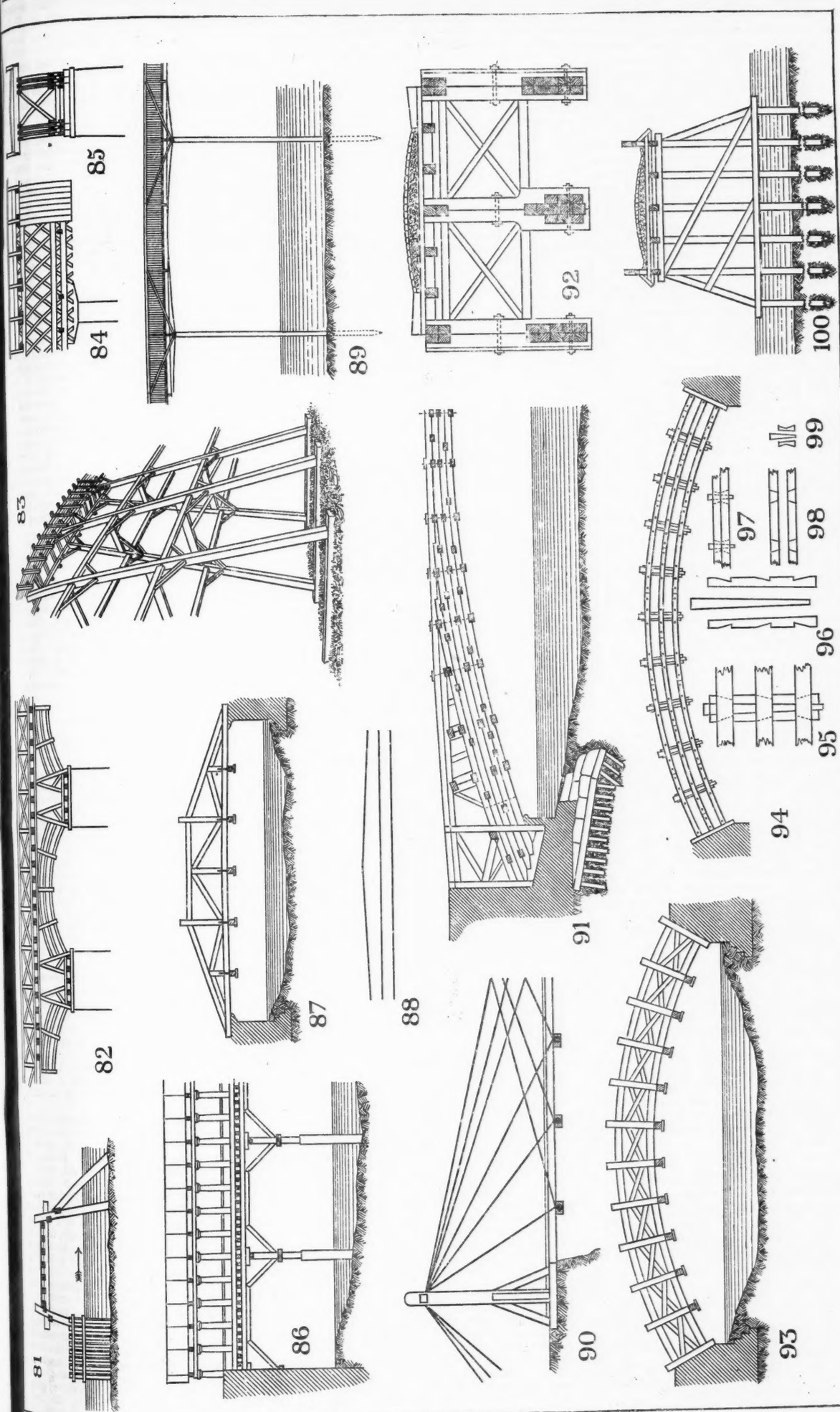
$$\beta = \frac{100 \times 300{,}000}{8{,}000 \times 10 \times 3}$$

$$\beta = 125 \text{ sq. in.}$$

Such a rib can be made up approximately of four pieces of stuff, 11 in. by 3 in., or two pieces, 11 in. by 6 in.

The sectional area of the ribs at the abutments will be slightly in excess of that at the crown owing to the greater pressure. Timber arches unless made perfectly rigid by proper bracing are not adapted to a variable load, such as a train in motion.

A curved rib bridge was designed by Palladio, and shown in fig. 93. It was probably the first idea of constructing a bridge on the principle of what may be described as *framed voussoirs*, similar to arch stones, and it is a principle which has since been adopted in some instances both for timber and iron construction. It is contended by some authorities that, owing to the shrinkage of the timbers and



Illustrations to Student's Column: Chapter VII. Bridges.

81. Cæsar's Bridge.
82. Trajan's Bridge.
83. Trestle Bridge.
84. Lattice Girder Bridge.
85. Lattice Girder Bridge.—Cross Section.
86. Bridge over the Brenta, by Palladio.
87. Bridge over the Cismone, near Bassano.
88. Flat Lintel Bridge.
89. Foot-bridge across the Clyde at Glasgow.
90. Timber Suspension Bridge.
91. Bridge of Bamberg on the Regnitz.
92. Bridge of Bamberg.—Cross Section.
93. Curved Rib Bridge, by Palladio.
94. Wooden Bridge over Portsmouth River, North America.
95 and 96. Detail of wedges.
97, 98, and 99. Details of keys.
100. Piles forming a Pier.

the vibrations caused by varying loads, the framing is continually endangered. The bridge of Bamberg on the Regnitz (fig. 91) in Germany, which was designed by Wiebeking in 1809, is a very good example of a close-ribbed bridge, erected to replace a former stone structure, which, by its piers, had so contracted the waterway that it was overturned by a flood. Consequently, the timber structure was designed to cross the river in one span of 208 ft., with a rise of 17 ft., and the width of the roadway was fixed at 32 ft. On looking at the cross section (fig. 92) which is to a larger scale, it will be seen that in the centre of the bridge three composite ribs are placed side by side, the centre one being five beams in depth at the abutments, which, however, are reduced to three at the centre of the span; the other two on each side of the centre consist of three beams throughout the span. On each side of the bridge two composite ribs are shown which consist of five beams at the abutments, reducing to three at the centre. The timbers, which were built into the abutments, were steeped in hot oil and covered with sheet lead. The cross ties and plates were constructed of oak, and the ribs and joists of fir. Price designed a simple but very useful bridge which could be carried to any desired place and erected at short notice; it can usually be used for spans up to about 40 ft. It consists of two curved ribs, one being 12 in. by 3 in., and the other 9 in. by 3 in., placed side by side, and breaking joint; these were connected by two ribs of similar dimensions forming the other side of the bridge, the connecting joists forming the roadway. The span was divided into five parts so as to make it portable, and the whole structure was fitted together by mortising the connecting joists into the ribs and keying them up. The celebrated wooden bridge over the Portsmouth River in North America (fig. 94) is a scientific development of Price's idea. This bridge has a span of 250 ft., and a reference to the illustration will show how ingenious is its construction, and how, by the system of wedging up its parts, the whole structure is rendered homogeneous. Figs. 95, 96, 97, 98, 99 show details of the wedges and keys.

Roadways.—The ordinary width of the roadway of a bridge varies from 18 ft. to 45 ft. for vehicular traffic, and from 5 ft. to 10 ft. for foot traffic. A width of 18 ft. just admits of two carriages passing one another, so that the carriage-way should vary by a multiple of nine. It is better not to lay the planking directly on to the principal beams, but to lay crossjoints, which will admit of a freer circulation of air. The road itself may consist of gravel and tempered clay, the latter to bind the gravel together, of about 12 in. in depth at the centre and 9 in. at the side. Separate footpaths must be made for passengers from 2 ft. to 6 ft. wide, and means for carrying off the water must always be provided. Occasionally—as, for instance, on the bridge of boats at St. Petersburg, which in winter is swung back against the bank to allow sleighs to pass on the ice, and on the bridges crossing the Golden Horn at Constantinople—it is found expedient to make a roadway of planking. This should consist of a double layer, the top one placed across the bridge to enable the horses to obtain a foothold; it is often treated with a coating of tar and sand. Bellidor recommended that bridges be paved, which he contended added greatly to their durability. Parapets should not be less than 3 ft. 6 in. high.

Scantlings of bridges should be calculated to allow for a crowded procession to pass over safely—the greatest strain it will be subjected to. Such a load is about 120 lbs. per foot super, which, if added to the weight of the framing and the roadway generally, makes a total of about 300 lbs. per foot.

APPLICATIONS UNDER THE LONDON BUILDING ACT, 1894.

The following recommendations of the Building Act Committee of the London County Council were agreed to at the weekly meeting on Tuesday, those applications which were granted being subject to certain conditions:—

Lines of frontage.

Hackney, South.—The erection of a bank on the east side of Mare-street at the corner of King Edward-road, on the further application of Messrs. Bourchier and Galsworthy on behalf of the London and Provincial Bank, Limited.

Marylebone, East.—The erection of an iron and glass roof over the entrance to the Frascati Restaurant, Oxford-street, on the application of Mr. J. W. Morrell, on behalf of the Holborn and Frascati Company, Limited.

Southwark, West.—That consent be not given to the re-erection of a church at the corner of Colnbrook-street (formerly Richmond-street), St. George's-road, with a projecting porch near the vicarage, on the renewed application (further considered) of Mr. W. J. H. Leverton; as the vestry objected to the first application, and now requests the Council to withhold its consent to the erection of the church as proposed; but it is stated by the vestry that a modified plan would be considered.

Norwood.—To the erection of a house on the south side of Paget-road, West Norwood, with its eastern flank and forecourt boundary next Clive-road, on the application of Mr. J. W. Brooker, on behalf of Mr. A. Sell.

St. Pancras, West.—To the erection of a one-story addition to No. 29, Hawley-road, Kentish Town, at the corner of Grange-road, on the application of Mr. D. E. Edwards.

Mile-end.—That consent be not given to the erection of one-story shop additions to Nos. 608 and 610, Mile-end-road, partly abutting upon Southgrove, on the application of Mr. J. H. Bethell, on behalf of Mr. W. Gower.

Wandsworth.—That consent be not given to the retention of a building which has been erected in Balham High-road, at the corner of Marius-road, in advance of the general line of buildings in each of those roads, on the application of Mr. J. Dickeson, jun., on behalf of Mr. R. Simpson.

Width of way.

Bow and Bromley.—To the erection of a house with shop, next No. 130, St. Leonard's-street, Poplar, on the application of Mr. C. E. Scrutton, on behalf of Mr. J. C. Crebbin.

Whitechapel.—To the erection of a four-story dwelling-house with a one-story addition at the rear on the site of No. 37, Durward-street, on the further application of Mr. W. Stewart on behalf of Mr. A. S. Tanner.

Woolwich.—That no action be taken with reference to a slight deviation from the plan sanctioned by the Council on October 3, 1893, for the erection of No. 32, Barnfield-road and 89, Princes-road, Plumstead; and that Mr. T. Batterbury, District Surveyor, who called attention to the matter, be informed of this decision.

Hackney, Central.—That consent be not given to the erection of a one-story building on the north side of Lyme-grove, Mare-street, with the forecourt fence, on the application of Messrs. Barrett & Power; as it is not considered expedient to permit the forecourt boundary of the building to be at less than the prescribed distance from the centre of the street, which is extremely narrow at this part, and no offer is made by the applicants to increase its width.

Norwood.—That consent be not given to the erection of two semi-detached houses on the north side of Canterbury-grove, at the corner of a street leading to Lansdowne Hill, on the further application of Mr. H. G. Assiter on behalf of Mr. A. Leaver.

Open Spaces about Buildings.

Bethnal-Green, North-East.—That the Council do not allow a modification of the provisions of Section 41 of the London Building Act, 1894, with regard to open spaces about buildings, so far as relates to the proposed erection of a block of buildings to be inhabited by persons of the working class, on the north side of Ada-place, Pritchard's-road, with an irregular open space at the rear, on the application of Messrs. Homer & Ridler, on behalf of Mr. C. D. Lavington; as having regard to the crowded state of the locality, the narrowness of the street upon which the building would abut, and the purpose for which it is to be used, it is considered inexpedient to allow any relaxation of the rules of the Act in this case; and moreover a portion of the rear of the building is shown on the plans to extend above the diagonal line directed by that Act to be drawn.

Chelsea.—That sanction be not given to certain deviations from the plans certified by the District Surveyor under Section 43 of the London Building Act, 1894, so far as relates to the proposed erection or a block of six-story residential flats on the site of Nos. 10, 10a, 11, 12, 13, and 14, Sloane-terrace, Sloane-square, as shown upon the plans, as modified by the further plan dated January 31, 1896, submitted with the application of Messrs. Bourchier & Galsworthy, on behalf of Messrs. Hilder & Edge; as having regard to the extent of the proposed deviations from the certified plans, the increased height of the new buildings, the insufficiency of the open space to be left at their rear, and for other reasons, it is considered, although an offer is made to widen a portion of Ellis-street, that the buildings should not be sanctioned, and it is also deemed inexpedient to permit the erection of the northern forecourt boundary at less than the prescribed distance from the centre of Sloane-terrace.

Whitechapel.—That sanction be not given to certain deviations from the plan certified by the District Surveyor under Section 43 of the London Building Act, 1894, so far as relates to the proposed re-building of No. 14, Commercial-street, Whitechapel-road, with an extension over an open gateway on the east side and an irregular open space at the rear of the building, on the application of Mr. J. M. Knight, on behalf of Mr. G. Gardner; it being considered that the extension of the upper floors of the house over the open gateway might to some extent affect the access of light and air to the adjacent buildings.

Formation of Streets.

Deptford.—That an order be sealed and issued to Messrs. Edwards, Son and Wilkinson sanctioning the formation or laying out of streets, 40 ft. wide, for carriage traffic, out of Deptford Lower-road and Trundley's-road, and the widening of a portion of the latter road, on the application to the Council, on behalf of Mr. W. J. Evelyn, the freeholder, and Dr. J. Bell and Sir W. J. Bell (trustees of the late Mr. G. Torr). That the names Grinstead-road, Scawen-road, Crooke-road (in continuation), Alloa-road (in continuation), Hicks-street and Kezia-street be approved for the new streets. That as the land upon which the streets are proposed to be formed is below Trinity high-water mark, the attention of the Local Authority and of the applicants be called to the provisions of Part XI. of the London Building Act, 1894, with regard to the erection of dwelling-houses upon low-lying land.

Cubical Extent.

Chelsea.—That consent be not given to the erection of a building at Salopian Wharf, Lot's-road, to exceed in extent 250,000 but not 450,000 cubic feet, and to be used only by the Refuse Disposal Company for the purposes of their trade, on the application of Mr. G. E. Holman, on behalf of the company; as it has not been shown to the satisfaction of the chief officer of the Fire Brigade and of the architect that the additional cubical extent is necessary for the purposes of the trade or manufacture to be carried on at the building, and that proper arrangements have been or would be made and maintained for lessening, so far as reasonably practicable, danger from fire; and, moreover, apart from other objections, no reason is seen why the building should not be divided by party walls in conformity with the rules of the London Building Act, 1894.

OBITUARY.

M. LOUIS AUGUSTE BOILEAU.—This able French architect has just died at the age of eighty-four. He was the first architect in France to make a systematic employ of iron construction, which he did first at the Church of St. Eugène at Paris, and afterwards in the Church at Vésinet. He has published some valuable studies on architectural woodwork and on construction generally. He has left to the "Union Centrale des Arts Décoratifs" most of his drawings and models.

GENERAL BUILDING NEWS.

CHURCH RESTORATION AT THORNTON, LEICESTERSHIRE.—The restoration has just been completed of the parish church of the three parishes of Thornton, Bagworth, and Stanton-under-Bardon, which is situated at Thornton. The architects were Messrs. Goddard, Paget, & Goddard, of Leicester.

BATHS AND WASHHOUSES, MARYLEBONE.—On the 13th inst. the foundation stone was laid of the public baths and washhouses for the Parish of St. Marylebone, on the site of the new building in St. Marylebone-road. The new building will contain four swimming baths, one of them 100 ft. long, and 105 private baths, as well as vapour and other baths. An important feature will be the laundry, accommodating seventy-six women at one time. Mr. Saxon Snell is the architect, and Mr. C. Wall, of Chelsea, is the contractor.

MISSION CHURCH, BRIDGEND, DEVONSHIRE.—A mission church is being erected at Bridgend, the nave and porch of which have been completed. The walls are lined with a buff-coloured brick, with a pitch-pine dado around. The floor is of prepared wood blocks, and the steps and dressings of the windows are of local granite. Messrs. Bennett & Quiller, masons; H. Brown, carpenter; J. Nicholls, stonemason; and J. Bennett, plumber, are carrying out the work, under the direction of Mr. A. E. Skentelbery, architect.

INFANT SCHOOLS, PATTISHALL, NORTHAMPTONSHIRE.—A new infant school has just been erected at Pattishall. The building, of brick, has been erected from plans of Mr. M. H. Holding, of Northampton, by Mr. Wingrove, the contractor.

ALTERATIONS TO PARTICK PARISH CHURCH, LANARK.—Extensive alterations on Partick Parish Church have just been completed. The additions to the church comprise the erection of a new bay and chancel to the nave, and of new halls, &c. The old structure, which was built in 1879, is of Gothic design. The addition is of the same style. The floor of the chancel is laid with tile. There are specially designed choir-stalls, communion-table, and a carved pulpit in oak. The communion-table and baptismal font, which is of marble and onyx, were the gifts of members of the congregation, while the pulpit was got by special contributions. An organ-chamber occupies one side of the chancel, and the organ has been renovated and decorated with silver pipes. Several windows of the new portion have been filled with stained glass. The halls are two stories in height, the lower portion consisting of a hall accommodating 250 persons, with cloak-rooms and class-rooms, while

stairs right and left at opening of the entrance corridor give access to the principal hall above, a building spanned by an open timber roof, with accommodation for between 400 and 500 persons. The work, which has been carried out from the designs and under the superintendence of Messrs. Steel & Balfour, I.A., architects, Glasgow, will cost about 3,300*l.*

WESLEYAN SUNDAY SCHOOLS, BILL QUAY, DURHAM.—On the 12th inst. the new Wesleyan Sunday Schools and Lecture-hall at Bill Quay were opened. The complete scheme comprises a chapel to seat 600 persons, a schoolroom to accommodate 300, infants' class-room for 50, and vestries and class-rooms. The portions now completed, and which are constructed of Heworth stone, are the schoolroom, the infants' class-room, and six class-rooms in connexion with the school. The total cost of this portion of the scheme, exclusive of the site, will be about 1,500*l.* The internal fittings are of pitch-pine. The cathedral lead glazing of the windows is from the studio of Mr. G. J. Baguley, of Newcastle. The heating arrangements have been executed by Messrs. Dinning & Cook, Newcastle. Foul air is extracted by shafts, terminating with Boyle's air-pump ventilator fixed in the roof of the turret. Mr. Robert Allison, contractor, of Whitburn, has constructed the building, from designs prepared by Mr. J. W. Taylor, architect, of Newcastle.

SUNDAY-SCHOOLS, LOUGHBOROUGH. — The Mayoress of Loughborough has just laid the foundation-stone of new Sunday-schools in connexion with St. Peter's Church, Loughborough. The new school building will comprise a Sunday-school and parochial hall, the whole being erected on the central hall system, to accommodate 800 scholars. It comprises a central hall, 61 ft. by 30 ft.; infants' room, 54 ft. by 19 ft.; six class-rooms, 13 ft. by 12 ft. each; committee-room, kitchen, cloak-rooms, and general out-offices. The building will be faced externally with red sand stock bricks and Derbyshire stone-dressings. Mr. G. H. Barrowcliff, of Loughborough, is the architect, and the contract for carrying out the work has been let to Mr. A. Faulks, also of Loughborough, for 2,262*l.* The heating apparatus, by Messrs. Messenger & Co., will be by steam-pipes.

CATHOLIC CHURCH, LEEDS.—The new church of St. Francis of Assisi, Holbeck, was opened on the 13th inst. The church is built in the Early English style of the thirteenth century. The plan comprises a nave with sanctuary, 113 ft. long, by 21 ft. wide, between the walls, the north and south aisles being 14 ft. wide and 106 ft. long. At the east end of the north and south aisles are chapels, and at the west end of the north aisle is a baptistry. At the west end of the south aisle is a tower, having a wide stone staircase leading to a gallery seated for part of the congregation, and having space for organ and choir. The church will have a peal of eight bells cast by Mr. Byrne, of Dublin. Parallel with the north aisle is a corridor communicating with the presbytery, and recessed arched openings into a chapel and two confessionals. The height of the nave is 55 ft. from the floor-line. Three large two-light traceried windows light the apse, and twenty two-light traceried windows light the clearstory. A seven-light traceried window lights the end of the nave over the gallery, and cusped single-light windows light the aisles. The west door and door under the tower have stone heads, under arched openings, sculptured with subjects referring to the life of St. Francis of Assisi. Internally the nave is divided from the aisles by three arches on each side, resting on stone columns, with moulded bases and carved and moulded capitals. Two similar arches resting on stone columns, with carved and moulded capitals, divide the sanctuary from the chapels on each side. The roofs are constructed with framed principals and rafters boarded underneath, the roof of the sanctuary being divided into panels. The principals of the sanctuary and the apse rest on stone shafts having moulded bases and carved caps. The shafts are carried up from the floor line of the sanctuary to the feet of the principals of the roofs. The church is constructed of brick, with stone dressings, and the roofs are covered with green Welsh slates. The heating is by hot water. The church will seat 700 adults, and the total cost is about 4,100*l.* The contractor for the bricklayers' and masons' work was Mr. William Barber, of Leeds; for the carpenters' and joiners' work, Messrs. William Mason & Son, of Leeds; for the slaters' work, Messrs. John Atkinson & Son, of Leeds; for the plasterers' work, Messrs. Cooper & Mason, of Stockton-on-Tees; for the plumbers' and glaziers' work, Mr. Joseph Auty, of Dewsbury; and for the painters' work, Mr. Abraham Bateman, of Leeds. The architect was Mr. John Kelly, of Leeds and London.

CHURCH, BERKELEY-SQUARE.—On the 15th inst. the Bishop of London consecrated the new church, dedicated to St. Anselm, which has been erected in Davies-street, Berkeley-square, to replace Hanover Chapel, Regent-street, which is about to be pulled down. The Duke of Westminster presented the site for the new church and the adjoining vicarage, and the cost of the new buildings will be 20,000*l.* The church of St. Anselm is a very singular building, utterly unlike any other place of worship in the Metropolis. The architects, Messrs. Balfour & Turner, do not venture to connect it with any known style of architecture, and wish it to be regarded as "unique." The church consists of a wide nave and north and south aisles, the east end of the latter forming a Lady Chapel, and is 104 ft. in length by 80 ft. wide. The roof to the nave is of stained Oregon pine, and is supported by twin columns of blue Robin Hood stone. The floor of the chancel and the sacrarium is of Irish green and black marble and Pavanaza marble. Above the altar rise four pilasters, supporting the symbols of the four Evangelists, the mysterious winged creatures described in the Apocalypse, carved out of huge blocks of Robin Hood stone. There is no east window, but it is intended, when funds are forthcoming, to cover the wall with mosaics. It is also proposed to introduce coloured decoration in other parts of the church, but at present whitewash reigns supreme. The church is seated with chairs for 600 worshippers. There is no pulpit and only a temporary organ. Over the side altar in the south aisle is placed a large painting, formerly in Hanover Chapel, representing the Agony in Gethsemane.—*Morning Post.*

CLOTHING FACTORY, DUDLEY.—A new clothing factory in King-street, Dudley, has been erected from designs by Mr. J. T. Meredith, of Kidderminster.

RENOVATION OF NORTH HILL CHURCH, NEAR LAUNCESTON.—The nave and aisles of the sixteenth-century church of North Hill, near Launceston, are about to be internally renovated from plans prepared by Mr. Otho B. Peter, architect, of Launceston. The new seating will be of oak throughout, and the bench ends carved by Mr. J. Northcott, of Ashwater.

PROPOSED PUBLIC HALL FOR HALIFAX.—The Watch Committee of the Halifax Town Council have decided to recommend the Council to include, in addition to the police-station, &c., on the site of the old infirmary, the erection of a public concert-hall in accordance with the plans of the Borough Engineer (Mr. E. R. S. Escott).

SANITARY AND ENGINEERING NEWS.

NEW PIER, STRANRAER, N.B.—The new pier at present in course of construction at Stranraer is upwards of 800 ft. long and 105 ft. broad. Berths will be provided for four large steamers, besides accommodation for cargo and excursion steamers at the point of the pier, where there will be a large travelling crane. The rebuilding, which is being done by Messrs. Morrison and Mason for the Portpatrick and Wigtownshire Railway Company was begun in the autumn of 1893. The new station, which is to be gone on with immediately, will have four lines of rails between the main arrival and departure platforms, and to the west of these an additional line for the Girvan and Glasgow platform. The whole work is to cost 40,000*l.* The engineers are Messrs. Dundas and Melville, C.E.'s, the companies' engineers; and the resident engineer is Mr. R. M. Dundas, C.E.

THE NEW KELVIN BRIDGE, GLASGOW.—The Joint Bridge Committee of Glasgow and Partick recently inspected the new Woodlands-road Bridge over the Kelvin previous to the taking over of the structure from the Caledonian Railway Company, by whom it was built. This bridge replaces the old structure, and is made of iron and red sandstone from designs by Messrs. Forman & M'Call, C.E.

PROGRESS OF WORK AT THE BLACKWALL TUNNEL.—The following works are completed at the Blackwall Tunnel—namely, the sewers on both sides of the river, the fireproof fence and the approach road at Messrs. Forbes, Abbott, & Lennard's premises at Ordnance Wharf and the Northumberland Wharf river-wall. The caissons for all the shafts are sunk to their final level, but the concrete bottom and water-tight floor for No. 1 shaft are not yet formed. During the month of January last, forty-three cast-iron rings, equivalent to a distance of 107 ft. 6 in., were erected, and out of a total length of 437 ft., from the centre of shaft No. 2 to that of No. 1, a length of about 164 ft. was finished at the end of the month. On the north side of the river, out of a total distance of 436 ft. of cut-and-cover, a length of 427 ft. is complete, and on the south shore all this description of work is executed. With the exception of the formation of the road the open approaches on both sides of the river are finished. The total approximate cost of the works done up to the end of January is 585,619*l.*, of which the sum of 14,028*l.* represents the value of the work executed during the past month.

PROPOSED NEW BRIDGE ACROSS THE TYNE.—It is proposed to erect a bridge from the lower end of Pilgrim-street, Newcastle, to Church-street, Gateshead. Messrs. Sandeman & Moncrieff, civil engineers, of Newcastle, in their report, say that in their opinion the most suitable and economical type would be that of a cantilever bridge. The bridge comprises a central river span of 500 ft. between centres of piers, approached by two spans of 150 ft. each on the Newcastle side, and by one span of 85 ft. across Church-street, on the Gateshead side. The proposed bridge would have a central roadway of 80 ft. width, suitable for double line of tramways and room to pass for vehicles, and two footpaths each 10 ft. wide, one on each side of the main roadway.

RAILWAY BRIDGE, ELY.—The old wooden railway bridge at Common Muck Hill, Ely, has just been removed and replaced by a modern structure. The new bridge, which was begun in July last, was constructed on a platform by the side of the old one, and has been finished for some time in readiness to be moved into position. The girders are of wrought-iron. There are two spans to the bridge, each 63 ft. on the skew and 45 ft. on the square. The girders are joined in the centre, and rest on cylinders in the middle of the stream. These are 5 ft. in diameter at the bottom and up to the bed of the river, and then taper off to 3 ft. 6 in. at the top. They go down to a depth of about 46 ft. below the level of the rails on to the blue gault, and, having reached so far, they were held up and prevented from sinking any further while workmen, from the inside, excavated the gault for a space about 7 ft. in diameter, and a depth of nearly 3 ft. This was then filled up with cement concrete, on which the cylinders rest. The cylinders were then filled up with cement concrete in layers of about 2 ft. 6 in. at a time. The lengths of the cylinders are 5 ft.; they are 1½ in. thick, with a flange at each end, and are bolted together, one length fitting into the other with a tongue and groove of about ½ in. The joints were embedded in putty, so that they were dry inside while the men were working below the river. They have been finished for some time and tested with a dead weight of about 130 tons. When the bridge is finished they will be cased with timber, so as to minimise as much as possible the risk of injury by boats, &c. The brick abutments go about 24 ft. below rail level, and rest on cement concrete foundations. About 160,000 bricks have been used, and these, with the exception of the Staffordshire blue bricks used for facing, were supplied by Mr. A. W. Itter, of Whittlesea. The cross girders of the bridge are about 12 ft. apart, and the rail bearers and metals were in position before the bridge was moved, the main girders resting on small trolleys on rails. Operations were commenced shortly after one o'clock on a recent Sunday morning. The scene was lighted up with Well's patent lights. Two steam-cranes were in use lifting the girders of the old structure and placing them on trucks for removal, and, as soon as this was accomplished, the men at the winches began work, and the structure, weighing about 120 tons, was moved in jerks of a few inches at a time until it had reached its proper place. This work occupied only about forty minutes. The bridge was then raised by hydraulic jacks, while the trolleys were taken off, the rail and timbers removed, and then it was lowered on to its bearings. The officials included Mr. Wilson, chief engineer, Mr. Sherlock, district engineer, and Mr. Kimm, district superintendent, Cambridge. The contractors were Messrs. Head, Wrightson, & Co., Limited, Teesdale Iron Works, Thornaby-on-Tees. Mr. Young, London agent to the firm, Mr. Anderson, managing director, and Mr. Clark, engineer, were also present. The bridge has been constructed under the superintendence of Mr. Edward Maxwell, foreman for the contractors, and the constant supervision of Mr. James Riches, clerk of the works to the railway company. This, and the bridge that was similarly constructed and opened last November, constitutes quite a new departure in the building of railway-bridges. A solid structure capable of carrying upwards of a hundred tons is removed, and a new bridge wheeled into its place and opened for traffic in seventeen hours, and while the work was in progress passengers were conveyed to the bridge and walked across on a platform to a train waiting on the other side with only a few minutes delay and scarcely any inconvenience.—*Cambridgeshire Times.*

LINSLADE SEWERAGE AND WATER SUPPLY.—A Parish meeting was held at Linslade on the 6th inst., to decide which of the schemes of sewerage and water supply should be recommended to the District Council—"Complete," or that of Mr. Lawrence, who prepared a scheme after adjudicating upon the competitive plans. By a very large majority the schemes of "Complete" were adopted. The author of the adopted schemes is Mr. H. Bertram Nichols, C.E., of Birmingham. The cost of the engineering work is estimated at 6,196*l.*

DURHAM SEWERAGE DISPOSAL SCHEME.—On the 6th inst. a Local Government Board Inquiry was opened in the Town Hall, Durham, into the sewage disposal scheme of the Durham City Corporation. The inquiry was held before Major-General Crozier, one of the Inspectors of the Local Government Board, and there were in attendance others interested either in promoting or opposing the scheme. The Town Clerk, Mr. Fred Marshall, and Mr. Charles J. Lomax, A.M. Inst. C.E., represented the Corporation. The Dean and Chapter of Durham, the Master of University College, the Principal of Hatfield Hall, Durham, and the Ratepayers' Committee were also represented. In opening the inquiry Mr. Marshall said that the scheme had for its object the prevention of sewage entering the River Wear. The Corporation were compelled to prevent this pollution owing to an action brought against them by the County Council. In consequence they advertised for schemes to be sent in for which premiums were awarded. The scheme sent in by "Valves," the *nom-de-plume* of Messrs. Lomax & Lomax, engineers, Manchester, was the scheme awarded the premium, and, with a slight exception, was the one which would be laid before the Inspector. In the original scheme there was no destructor. The Corporation took this matter into

consideration, and, having regard to the great difficulty of dealing with the refuse from the city, they instructed Messrs. Lomax to add a destructor to their scheme. The estimated cost of the proposed works amounted to, exclusive of land, 25,222*l.* In addition to that, there was the estimated expenditure of 1,500*l.* for the land. The Local Government Board were asked to sanction the borrowing of 30,000*l.* Mr. Lomax then explained the details of the scheme, which included main concentrating sewers, following the course of the River Wear to the outfall site near Kepier, at which point the sewage will be elevated 32 ft. high, and treated first in precipitation tanks, and afterwards through polarite filter-beds, the effluent being passed over prepared land filtration areas. The estimated cost of the precipitation-tanks and filter-beds was stated to be 4,453*l.*; the destructor, engines, and pumps, together with the buildings, 6,257*l.* Mr. Coldwell, the City Surveyor, was called, and said that the amount of refuse collected from the city, as stated by Mr. Lomax, was correct. He stated that the existing sewers were all laid with pipes. There was great difficulty in obtaining refuse-pits in Durham, and no other method of disposing of the refuse would be advantageous. The inquiry was then closed.

HORFIELD SEWAGE DISPOSAL WORKS, BRISTOL.—The new sewage disposal works of the Horfield Urban District Council were formally opened on the 10th inst. The Council, being forced by an order of the Bristol County Court Judge to cease polluting a brook, Mr. A. P. I. Cotterell, C.E., of Bristol, was instructed to carry out the best-known and available means of purifying the sewage of the district, and his plans were accordingly submitted to the Local Government Board, who, after due inquiry, approved the scheme, which includes the "International" process of ferozone and polarite. The drainage and outfall works have been completed and in operation for about two months. The sewage is first treated with ferozone, and finally passed through polarite filters.

FOREIGN.

FRANCE.—Several interesting exhibitions are now open. Among them is that of pastels and water-colours by MM. Adolphe and Victor Binet, at 17, Rue Caumartin; that of water-colours by Mr. William Thornley at the Georges Petit Gallery, and lastly the exhibition of the "Société de St. Jean pour l'encouragement de l'Art Chrétien" (painting, sculpture, engraving and architecture), which is to be found at 76, Rue des Saints-Péres.——A boys' school just opened in Rue St. Gervais, designed by M. Eugène Hénard, merits note as a very satisfactory piece of architectural treatment combined with a well-arranged plan.——The Louvre has just acquired a fine example of Perugino in the shape of a painting of St. Sebastian, as well as three portraits by David and a fine picture by Delacroix, "Les Femmes d'Alger."——M. Lecomte de Nouy, the architect, has just completed the tomb of Guy de Maupassant at Pére Lachaise cemetery.——It is announced that M. Munkaczy, the well-known painter, will shortly be called on to quit Paris for his native country Hungary, to take the superintendence of an Institute of Fine Arts there.——The inhabitants of the IInd. arrondissement of Paris have appointed a committee to demand the completion of the Bibliothéque Nationale, or at all events the formation into a public square of the land adjoining Rue Vivienne, which has for a long time been surrounded by hoardings.——A new iron bridge is to be built across the Marne, between Nogent and Champigny, of three bays resting on masonry piers.——Some very large new barracks are to be built at Melun, at an estimated cost of 2,500,000 francs.——The "Société Regionale" of architects of Bordeaux and South-west France has appointed M. Louis Labbé as its President for this year, and Jelineau as Vice-President. The "Société Regionale" of the North of France has appointed M. Destombes as President and M. Dubuisson as Vice-President.——A casino theatre is to be built at Hyéres, at a cost of 400,000 francs.——There is a proposal to erect a monument at Metz to the memory of Ambroise Thomas the composer, who was born there.——The French Government contemplate the foundation of a French Archæological Institute at Cairo.——One of the most able architects of the city of Lyons, M. Gaspard André, has just died at Cannes, after a long illness. He was a former winner of the "Prix de Rome," and architect of the Hôtel de Ville of Neuilly, of the Theatre des Célestins, and of the Protestant church on the Quai de la Guillotières. He also designed the fine fountain on the Place des Jacobins. He had recently been commissioned, as the result of an important competition, as architect for the new University of Lausanne.

NEW MUNICIPAL BUILDINGS, CALCUTTA.—The firm of Messrs. Martin & Co. are getting up plans and estimates for what amounts practically to the construction of new buildings for the Calcutta Corporation, utilising the whole of the site on which their present paltry building stands. Mr. Stirling, the architect, has, we believe, prepared a design that will make a very characteristic addition to the architecture of Calcutta, and we hope no time will be lost in bringing the work to a state of completion.—*Indian Engineering.*

CATHEDRAL FOR RANGOON.—The plans and estimates of the new Roman Catholic Cathedral of Rangoon have been accepted, the cost exceeding three lakhs of rupees. *Indian Engineering* says that the drawings prepared by Mr. H. Hoyne-Fox, A.R.I.B.A., for the proposed edifice, show that it will be in every way a fitting memorial to a great and good man—Paul Bigandet, the Apostle of Burma.

MISCELLANEOUS.

ROYAL ACADEMY EXHIBITION.—The day for receiving pictures and drawings this year are Friday, Saturday, and Monday, March 27, 28, and 30; and for sculpture, Tuesday, March 31.

THE PUTNEY SCHOOL OF ART.—The managers of this school have secured the services of Mr. G. W. Rhead as Instructor in Design. Mr. Rhead has executed important decorative work in London, Manchester, Edinburgh, Bristol, and Birmingham, and he has for many years contributed to the illustrations of the *Portfolio*, the *Magazine of Art*, the *Art Journal*, and other publications. He is a Fellow of the Royal Society of Painter-Etchers, a member of the Arts and Crafts Society, and a member of the Art Workers' Guild. Mr. E. W. Ascough, who has been appointed Second Master of the school, was formerly Modelling Master to the Metropolitan School of Art, Dublin. His teaching there was signalised by great success, his pupils winning gold, silver, and bronze medals and national scholarships.

THE ROYAL EXCHANGE.—In the course of a petition recently addressed to the Court (Queen's Bench Division) by the Corporation, as trustees of Sir Thomas Gresham's estates, against corporation duty in respect of the Royal Exchange, some interesting particulars were set forth. It appears that in 1566, the public bourse for English and foreign traders in Lombard-street having proved inadequate, the citizens raised a public subscription of 3,532*l.* for buying a plot of ground between Cornhill and Threadneedle-street, which they conveyed to Gresham, he undertaking to erect thereon, at his own charges, a more commodious bourse. That building (constructed of Flemish materials, and designed by Henrycke, a Fleming) was opened by Elizabeth on January 23, 1570-1. By his will, five years later, Gresham founded certain lectures, and as regards the Exchange, with its "pawns" (paths, or walks for stalls), cellars, vaults, and shops, left one moiety a-piece to the Mercers and the Corporation, in trust for payments under his will. On the death, 1596, of Gresham's widow, the trustees assumed possession. After the Great Fire they rebuilt the Exchange, at a cost of 80,000*l.*, from Edward Jerman's designs, and continued to pay the lecturers, &c., applying the rents of shops on the upper floor in repayment of moneys advanced, for the rebuilding, by the Corporation. After 1737 the Exchange fell into disuse, and the shops became tenantless. In 1768 and 1819 the fabric was repaired at a total cost of 53,000*l.* After the fire of 1838 the present Royal Exchange was built on an enlarged site at a cost of 170,000*l.** We may add that on the demolition (1770-3) of Gresham College, the lectures were transferred to a room over the Royal Exchange, and thence, in 1838, to the theatre of J. B. Bunning's (old) City of London School, which had been built three years previously on the site of Honey-lane Market. The present Gresham College was opened in 1844. Izaak Walton kept a stall in the upper "pawn" of the old Royal Exchange.

TRADE DINNER.—The second annual dinner of the principals, heads of departments, and representatives of the firm of Messrs. Young & Marten, Stratford, was held at the Holborn Restaurant recently. Mr. H. H. Marten (principal) occupied the chair, and Mr. E. Montague Edwards (general manager) the vice-chair. There were also present: Mr. Frank and Mr. Ernest Marten, Mr. A. B. Corke (superintendent), and the heads of departments. The toast of "The Queen and Royal Family" having been proposed by the Chairman, the Vice-Chairman proposed "The Firm," and said he felt confident that he was re-echoing the sentiments of everyone present in saying that it gave them very great pleasure to see Mr. Marten in that honoured seat on this occasion, and it was to them a source of much regret that he was unable to be there last year. As regards the prosperity of the firm, he was firmly convinced that everyone of them had the interest of the firm thoroughly at heart. The Chairman, in responding to the toast, said he had always felt that no business could reach a successful issue without the hearty goodwill of the *employés*, and that he felt confident he possessed in them all. The Chairman then proposed the toast "The General Manager and Staff," to which Mr. Edwards replied. Mr. Frank Marten submitted the toast of "The Dinner Committee," and Mr. A. B. Corke responded.

CROYDON AND DISTRICT BUILDERS' FEDERATION.—The annual dinner of this Association took place on the 11th inst. at the "King's Arms" Hotel, Croydon. Mr. Councillor Martin Taylor presided, and he was supported by the Mayor (Alderman F. T. Edridge) and the Deputy-Mayor (Alderman S. L. Rymer). The Chairman proposed the customary loyal toast, and Mr. Alderman Rymer proposed "The Army, Navy, and Reserve Forces." Mr. Robert Ridge, Surveyor to the Croydon School Board, expressed thanks for coupling his name with the toast.—Mr. Councillor Dobson, J.P., gave "The Croydon and District Builders' Federation." He congratulated them on the circumstance that they had not been dragged into the London Federation, and that they had decided to run alone. He believed that it was to the interest of Croydon working men that there should be a Croydon Builders' Association. In consequence of their strength they were able to give way and make concessions when otherwise they would be considered weak.—Mr. Martin Taylor, whose name had been associated with the toast, replied. The building trade had been busy and prosperous in Croydon during the past few years. In regard to the Society, numerically they were about the same as last year, while the same could be said about the finances. They had not a large balance, but they had managed to get along without levying on the members.—Mr. Samuel Page, the Vice-President, proposed the "Corporation of Croydon." The Mayor responded. Other toasts were "The Trade of Croydon and District," proposed by Mr. Evan Carpenter, Councillor Lillico responding; and "The Hon. Secretary (Mr. Pearson)," proposed by Mr. Smith.

THE FIRE AT SOUTH LAMBETH-ROAD.—Messrs. Higgs & Hill ask us to state that their saw-mills and joiners' shops were not destroyed in the fire that occurred on the 12th, and that they are able to continue work as usual.

SANITARY INSTITUTE.—The introductory lecture to the twenty-first course of lectures and demonstrations in sanitary science for sanitary officers was delivered at the Parkes Museum, Margaret-street, W., by Professor A. Wynter Blyth, on Monday. In the course of his remarks he spoke of the importance of the knowledge of hygiene, which was applicable to all stages of life, and was contributory to the highest condition of health. He referred to the necessity of studying the literature on hygiene. At the Parkes Museum there were a large number of volumes (some 7,000) all more or less connected with the subject. He then dwelt upon the importance of gaining practical, as well as theoretical, knowledge by visits to model estates, &c., and wherever sanitary appliance could be found. Knowledge of hygiene was as necessary for women as for men. There was as urgent need for female sanitary inspectors as there had been for factory inspectors. He urged the importance of examinations. It was in that institution obligatory. He urged them to study tuberculosis, and, in conclusion, said there was no lack of opportunity for self-instruction, and, given sufficient leisure and application, it would be the students' own fault if they failed.

PROPOSED CENTRAL LIBRARY, SHEFFIELD.—At the monthly meeting of the Sheffield City Council, held at the Council Chambers, Surrey-street, on the 12th inst., the Free Public Libraries and Museum Committee asked the Council to rescind the resolution of the Council of September 22, 1890, ordering the expenditure of 2,000*l.* on the present Central Library, and submitted a recommendation, "That the Finance Committee be informed that the amount of the proposed capital expenditure of this Committee for the year commencing March 26, 1896, will be the sum of 20,000*l.*, for the purpose of erecting a new Central Library in Surrey-street, on the site of the existing one." Mr. H. P. Marsh moved an amendment that the recommendation be not confirmed. He alluded to the many uncompleted schemes which the Council had in hand, and said they were not justified in undertaking this new and altogether unnecessary expenditure. Mr. Harry Fisher seconded the amendment. After some discussion, the Mayor, the Duke of Norfolk, said he thought it would be wisest to let the matter go before the Finance Committee before dealing with it in the stringent and arbitrary way suggested by the amendment. The amendment was then withdrawn, and eventually Alderman W. H. Brittain withdrew the recommendations in regard to the new library.

LECTERN, THRUSHELTON, DEVONSHIRE.—A new lectern has just been placed in Thrushelton Church. It is of English oak, and is the handiwork of Messrs. Harry Hems & Sons, of Exeter.

REGISTRATION OF PLUMBERS.—Among the Private Bills shortly to be introduced in the House of Commons this Session, is the Plumbers' Registration Bill, which is backed by Mr. Lees Knowles, Earl Compton, Mr. Dixon, Dr. Farquharson, and Mr. Sexton, and has the support of some of the principal Municipalities of the United Kingdom.

PROPOSED WIDENING OF FLEET-STREET.—At the meeting of the City Commissioners of Sewers on the 18th inst., the Finance Committee reported with regard to the proposed rebuilding of 98-100, Fleet-street, and recommended that negotiations for an improvement at the premises should be confined to canting the corner of Bride-lane. Mr. Woodbridge moved an amendment to refer the report back, with instructions to the Committee to negotiate for setting back the premises to the line agreed upon in the formation of Ludgate-circus. A long discussion ensued, during which members

* Opened by the Queen on October 28, 1840. The apposite Scriptural motto on the pediment was suggested by Dean Milman to Prince Albert, whom Tite, the architect, had asked for an appropriate inscription.

expressed the opinion that application should be made to the London County Council for a contribution towards the cost, the general feeling being that Fleet-street should be widened gradually on the same principle as that adopted in the widening of Ludgate Hill. This was eventually agreed to, the amendment being carried by a large majority.

LEGAL.

LIABILITY OF LOCAL AUTHORITIES UNDER SUB-CONTRACTS FOR NEGLIGENCE:

IMPORTANT CASE IN THE COURT OF APPEAL.

THE case of Hardaker and Another *v.* The Idle District Council and Another, which came before the Court of Appeal, composed of Lords Justices Lindley, A. L. Smith, and Rigby, on Monday last, for judgment, on the application of the plaintiffs for judgment or for a new trial, raised an important point as to the liability of a local authority, employing a contractor, who had, in the construction of a sewer, omitted to keep a gas-pipe supported, so that it became fractured and the gas escaped into the plaintiffs' house, whereby it was wrecked and the female plaintiff injured. The facts are shortly these:—The District Council, on October 10, 1894, gave the male plaintiff notice, under Section 150 of the Public Health Act, 1875, to make a sewer in Moorfield-place, he being the occupier of a house abutting thereon; but the notice not being complied with, the Council, under the provisions of the section, proceeded to execute the works mentioned in the notice, and employed the defendant Thornton to execute the work. By the contract between Thornton and the District Council, it was agreed that the contractor should execute the works in the most workmanlike and substantial manner, particular attention being paid to any directions or instructions which the inspector appointed by the Council to superintend the work might from time to time give as the work proceeded. The Inspector was given power in the event of the contractor's foreman or workmen disobeying his orders to forthwith discharge them, and also to stop the works at any stage, and to enlarge, diminish, modify or vary the works or any part thereof, which, however, was not to annul the contract. It was also further agreed that the care of the entire works, until completed, should remain with the contractor, who should be responsible for all accidents and damage to persons or property arising from the works, and that the contractor should protect all gaspipes which might be laid bare or otherwise interfered with. It was proved that the contractor had been guilty of negligence by insecurely packing the soil around a gaspipe in use after the excavation had been made for the sewer, whereby the gaspipe was broken and the gas escaped. Mr. Justice Wright gave judgment for the plaintiffs against the contractor for 45*l.*, but held that there was no case against the District Council. The plaintiffs in the present appeal contended that the District Council were also liable.

Lord Justice Lindley, in the course of an elaborate judgment, said that the Local Board could not by employing a contractor get rid of their own duty to other people, whatever such duty might be. If the contractor performed their duty for them, it was performed by them through him, and they were not responsible for anything more. They were not responsible for his negligence in other respects, as they would be if he were their servant. Such negligence was sometimes called casual or collateral negligence. If, on the other hand, their contractor failed to do what it was their duty to do or get done, their duty was not performed, and they were responsible accordingly. The duty of the Local Board was not performed by constructing a proper sewer only, but also to take care not to break any gas-pipes which they cut under, and this involved properly supporting them. This duty was not performed. They employed a contractor to perform their duty for them, but he failed to do so. It was impossible, he thought, to regard it as a case of collateral negligence, and on those grounds he thought that the District Council were liable to the plaintiffs. In his opinion the appeal, therefore, must be allowed, and judgment entered for the plaintiffs for 45*l.* and the costs of the action; and the District Council must pay the costs of the appeal.

Lords Justices A. L. Smith and Rigby concurred, and the appeal was therefore allowed on the terms stated.

Mr. Tindal Atkinson, Q.C., and Mr. Longstaffe represented the plaintiffs; and Mr. Kershaw, Q.C., and Mr. Waugh the District Council.

TRADES' UNION DISPUTE AT GLASGOW:

ACTION AGAINST A SOCIETY OFFICIAL.

SHERIFF BEGG has just given a decision in the Greenock Small Debt Court in a case affecting workmen. An action was raised at the instance of John Macfarlane, plumber, Prestwick, near Manchester, against James Dennistoun, plumber, Greenock, for 10*l.* for damages sustained by the pursuer in consequence of his dismissal from the service of Messrs. Peter Macfarlane & Co., plumbers, Port-Glasgow, in October last.

The pursuer contended that his dismissal was due to the illegal and unwarrantable actions of the defender in causing or inducing other workmen of Messrs. Macfarlane & Co. to refuse to return to work until they dismissed him, and that his masters were thereby compelled to dismiss pursuer.

From the evidence, it appeared that pursuer had been working for about a fortnight at a wage of sevenpence per hour instead of eightpence halfpenny per hour, which is the standard wage paid in Port Glasgow to journeymen plumbers. On this fact becoming known it was reported to the defender, who is the local secretary of the Operative Plumbers' Association of Great Britain and Ireland, and he, along with another, were appointed to wait upon pursuer's employers and get them either to pay pursuer the standard rate of wages or to dismiss him. These delegates, on meeting with the employers, were informed that pursuer would be dismissed. Macfarlane subsequently told some of his men that he had made up his mind not to dismiss pursuer but to pay the standard wage, and the men expressed themselves quite satisfied with that, and left to resume work. But shortly afterwards they returned and reported that they were not to be allowed to begin work. The defender, Delegate Dennistoun, then arrived on the scene, and on Mr. Macfarlane asking why his men were not to be allowed to resume work, defender said that as the other delegate was not present he could not take it upon himself to decide. The employers thereupon sent for pursuer and dismissed him.

The Sheriff, in giving judgment, stated that he must, from the evidence, hold the defender liable in damages in the full sum claimed, although he considered defender's conduct up to his last meeting with the employers quite prudent and judicious.—*Glasgow Evening News.*

ARCHITECTS' FEES.

AT the Worcester Assizes, on the 12th inst., before Justice Grantham, Mr. Lewis Sheppard, architect and surveyor, Worcester, sued Mr. Thomas C. Quarrell, solicitor, Worcester, for 156*l.* 16*s.* 6*d.*, architect's commission. Several small items having been paid, the amount in dispute was reduced to 140*l.* 3*s.*

Mr. R. H. Amphlett and Mr. Farrant (instructed by Messrs. R. P. Hill & Son) were for plaintiff, and Mr. Vachell (instructed by Mr. T. R. Quarrell) for the defendant.

The defence was that plaintiff exceeded his instructions, and made excessive charges.

Mr. Amphlett explained that the claim arose in respect of advice given and work done with respect to proposed new and additional buildings and a dairy at Brownheath. Commission was charged at 1 per cent. for preparing plans of proposed additions to the farm buildings, estimated to cost 2,500*l.*; and 2 per cent. was charged for preparing the plans of a proposed new house, estimated to cost 5,600*l.*

Plaintiff gave evidence to this effect, and produced the plans. He said the charges he made were fixed by the Institute of Architects, except that he might have charged 1½ per cent. with regard to the additions.

Defendant gave evidence to the effect that the instructions were for a house to cost 2,000*l.*, and when he found the cost would be 5,000*l.* he abandoned the work altogether.

The jury gave a verdict for the plaintiff for the amount claimed.

MEETINGS.

FRIDAY, FEBRUARY 21.

Architectural Association.—Mr. Arthur Silver on "The Modern Stencil." 7.30 p.m.

Royal Academy of Arts.—Lectures on Architecture, by Professor Aitchison, A.R.A.: "Romanesque Architecture." V. 8 p.m.

Royal Academy of Arts.—Lectures on Sculpture, by Dr. A. S. Murray: "The Representation of Deities." II. 4 p.m.

Incorporated Association of Municipal and County Engineers.—Metropolitan District Meeting.—(1) Mr. J. Patten Barber on "Some Suggested Amendments of the Metropolis Local Management Acts"; (2) Mr. W. Nisbet Blair on "The Wear of Hardwood Paving and the Weight of Traffic thereon." 7.30 p.m.

SATURDAY, FEBRUARY 22.

Sanitary Institute (Lectures for Sanitary Officers).—Inspection and Demonstration at the Aylesbury Dairy Company's Premises, Bayswater. 3 p.m.

Architectural Association.—Second Spring Visit to (1) house in Park-lane, at the corner of Aldford-street; (2) to Claridge's Hotel, Brook-street, Grosvenor-square. 3 p.m.

MONDAY, FEBRUARY 24.

Royal Academy of Arts.—Lectures on Architecture, by Professor Aitchison, A.R.A.: "Romanesque Architecture." VI. 8 p.m.

Royal Academy of Arts.—Lectures on Sculpture, by Dr. A. S. Murray: "The Representation of Deities." III. 4 p.m.

Society of Arts (Cantor Lectures).—Professor J. M. Thompson on "The Chemistry of Certain Metals and their Compounds used in Building, and the Changes Produced in them by Air, Moisture, and Noxious Gases, &c." II. 8 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Professor A. Wynter Blyth on "The Law Relating to the Supervision of Food Supply." 8 p.m.

TUESDAY, FEBRUARY 25.

Institution of Civil Engineers.—Discussion on Mr. Granville Carlyle Cuningham's paper on "The Electric Street Railway System of Montreal, Canada." 8 p.m.

King's College, London.—Professor Banister Fletcher on "Architecture." 8 p.m. (Free).

Society of Arts (Applied Art Section).—Mr. William Burton on "The Palette of the Potter." 8 p.m.

London School of Economics and Political Science (9, John-street, Adelphi).—Mr. E. J. Harper on "The Rating Question: Annual Value the Basis of Rating." III. 6.45 p.m.

Auctioneers' Institute.—Mr. John Hepper on "Provincial Auctioneers: Their Position, Practice, and Prospects." 8 p.m.

Carlisle Architectural, Engineering, and Surveying Society.—Paper by Mr. A. W. Johnston.

WEDNESDAY, FEBRUARY 26.

Carpenters' Hall, London Wall.—Mr. H. H. Statham on "The Façades of the English Cathedrals," with lantern illustrations. Mr. Alfred Waterhouse in the chair. 8 p.m.

St. Paul's Ecclesiological Society.—Two papers to be read. 8 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Inspection and Demonstration in the Parish of St. George's, Hanover-square. 2 p.m.

Society of Arts.—8 p.m.

Northern Architectural Association.—Mr. J. Potts on "The Antiquities of Jerusalem and the Temple Area." 7.30 p.m.

THURSDAY, FEBRUARY 27.

Royal Academy of Arts.—Lectures on Sculpture, by Dr. A. S. Murray: "The Representation of Deities." IV. 4 p.m.

Society of Antiquaries. 8.30 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Professor A. Wynter Blyth on "Sanitary Laws and Regulations Governing the Metropolis." 8 p.m.

Institution of Electrical Engineers.—(1) Conclusion of discussion on (*a*) "The Electric Wiring Question," by Mr. F. Bathurst, (*b*) "Concentric Wiring," by Mr. Sam. Mavor; (2) Mr. G. L. Addenbrooke on "High-Voltage Lamps and their Influence on Central Station Practice." 8 p.m.

FRIDAY, FEBRUARY 28.

Institution of Civil Engineers (Students' Meeting).—Mr. Arthur S. Butterworth on "Loughborough Sewage-disposal Works." 8 p.m.

SATURDAY, FEBRUARY 29.

Sanitary Institute (Lectures for Sanitary Officers).—Inspection and Demonstration of Disinfecting Apparatus and Model Steam Laundry, at St. John's Wharf, Fulham. 3 p.m.

Builders' Foremen and Clerks of Works' Institution.—Annual Dinner, Holborn Restaurant. 6 p.m.

Edinburgh Architectural Association.—Visit to the M'Ewan Hall.

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

786.—FLUSHING CISTERNS: *T. Rhodes and another.*—An arrangement of double or single valve cistern in which the delivery valve is provided with a hollow stem or guide having holes, to the level of which the water subsides when the valve is lifted from its seat. Other modifications are mentioned, comprising a valve arranged with a side discharge and a loose valve-face, and a valve fitted in a horizontal or inclined cylinder. The inlet or ball-valve consists of a T-shaped lever, pivoted at one end and provided at the other with a flexible valve-face. It is operated by a ball or float.

2,710.—PRESERVING WOOD: *R. Aitken.*—By this process the wood is impregnated with a solution of heavy oils or waxes, the solvent, which may be naphtha, being afterwards evaporated off. The wood may be coloured by dissolving in the solution such colours as are soluble.

3,830.—HEAT REFLECTOR: *G. Everth.*—A heat reflector plate for domestic fire-places composed of non-combustible material, and provided with slots and baffle-plates formed from the blanks, cut out of the slots.

5,012.—DOOR FASTENINGS: *C. Jones.*—A fastening for folding doors or windows, consists of a lever pivoted horizontally near the edge of the first closing door, with one arm protruding so as to come in contact with the other door when closing. The contrivance is so arranged that the other arm of the lever is turned in position behind a fixed stud when both doors are closed so that the first door is secure until the second is opened.

20,194.—DRAUGHT PREVENTER: *J. Lewis.*—For the bottoms of doors. Consists of a roller covered with baize, and having a spindle at each end, which turn in vertical slots formed in projecting brackets. The roller is thus allowed to rise and fall on uneven floors.

23,498.—WINDOWS: *J. McDougall.*—Improvements for facilitating the reversal of sashes for cleaning. Consists in rebating window-sashes and hanging them from the bottom, making the upper parts of the parting and inner beads removable, rebating the parts of the pulley-stiles in which the lower sash slides, and making the said sash of corresponding width. This facilitates the removal of the upper sash. In a modification the upper sash may be reduced in width, and filling strips nailed upon those parts of the stiles on which the sash slides. Hinged pocket doors are provided in the frames for affording ready access to the weights.

23,648.—WATER-CLOSETS: *H. Scattergood.*—An attachable water-closet seat for children's use, consisting of a sheet of thin material, such as sheet-metal, provided with a hinge, and adapted to be applied to the ordinary water-closet seat between the seat and cover.

NEW APPLICATIONS FOR LETTERS PATENT.

FEBRUARY 3.—2,451, D. Froment, Treatment of Marble and Similar Stone.—2,470, J. Coffin, Springs for Doors, Windows, &c.

FEBRUARY 4.—2,475, J. McLaren, Chimney Cowl.—2,499, G. Knowles, Ventilators and Air-inlets.—2,485, A. Brookes, Builders' Scaffolding.—2,520, J. Dawber, Domestic Fireplaces.—2,538, J. Heywood, Cans and Canisters for Paint, Varnish, &c.—2,591, A. Boult, Stoves.—2,605, J. Lewthwaite, Construction of Moulds and the Manufacture of Plastic Slabs or Roof Tiles.

FEBRUARY 5.—2,613, W. Beer, Artificial Marble.—2,614, F. Maxwell and W. Beer, Artificial Stone.—2,627, J. Spencer, Machines for Dressing, Moulding, Planing, and Shaping Stone.—2,630, A. Harkess, Disconnecting Ventilating-trap for Drains and Sewers.—2,633, G. Anderson, Stone-sawing Machinery.—2,636, P. Willis, Draught-excluders for Doors.

COMPETITION, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITION.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
Workhouse Buildings ...	Upton - on - Severn Union	.....	Mar. 2

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c. Supplied by	Tenders to be delivered.
*Making-up Road	Finchley U.D.C	Council Offices	Feb. 24
Sewers	Alton (Hants) U.D.C.	Wm. Trimmer, Clerk to Council, Alton	Feb. 25
Two Houses, Tennyson-avenue, Bridlington	J. W. Brown	J. Earnshaw, Archt. Wellington-road, Bridlington Quay	do.
Road Works	Cardiff U.S.A.	W. Harpur, C.E. Town Hall	do.
Houses, North-road, Newton Heath, Lancs.	L. & Y. Ry. Co.	H. Shelmerdine, Archt. Hunt's Bank, Manchester	do.
House, Newtown, Carlisle	J. Cook	Johnstone Bros. Archt. 39, Lowther-st. Carlisle	do.
*Completion of Waterworks	Barmouth U.D.C.	T. Blackburn, C.E. Barmouth	do.
Schools, Queen-street, Fenton	Stoke-on-Trent Sch. B.	R. Scrivener & Sons, Archt. Howard-place, Hanley	do.
Six Houses, Monk Bretton, near Barnsley	.....	H. Crawshaw, Archt. 13, Regent-street, Barnsley	do.
Police Station, Dalton-in-Furness	.....	J. W. Grundy & Son, Archt. Ulverston	Feb. 26
Sewering, &c. Wilsden, near Bradford	.....	John Kirk & Sons, Archt. Huddersfield	do.
Pair of Villas, Alnmouth-road, Alnwick	W. R. Hindmarsh	W. R. Hindmarsh, Jun. Archt. 22, Bondgate-without, Alnwick	do.
Waiting Rooms, Cemetery-road and Bradford-road	Huddersfield Corp.	Borough Surveyor	do.
Casual Wards	Bridport Union	J. J. Roper, Guardians' Offices	do.
Store Extension, Lockwood	Huddersfield Indus. Soc. Lim.	J. Berry, Archt. 9, Queen-street, Huddersfield	Feb. 27
Limestone Road Metal, &c.	Gateshead Corp.	J. Bower, C.E. Boro' Surv. Town Hall	do.
Road Works, near Berwick	Northam R.D.C.	Mr. Short, Surveyor, Ord Cottage, Berwick	do.
Additions, &c. to Brunswick House Morley, Yorks	.....	J. Sykes, Archt. Princess-street	do.
Two Houses, Pasture-lane, Clayton, Yorks	.....	J. Drake & Son, Archt. Winterbank, Queensbury	Feb. 28
*Fixtures and Fittings	Met. Asylums Board..	T. W. Aldwinckle, 1, Victoria-st. Westminster	do.
Road Works	Buckingham R.D.C.	C. J. Varney, Surv. Preston Bissett, Buckingham	do.
Kerbs, Setts, and Flags	Brighouse (Yorks) T.C.	Borough Surveyor	do.
Main Sewer, Ladywell-street, &c.	Glasgow Corporation	J. Lang, City Chambers, Glasgow	do.
Macadam (12,000 tons)	Hull Corporation	A. E. White, Boro' Engr. Town Hall	do.
*Making-up Road and Pipe Sewers	Walthamstow U.D.C.	G. W. Holmes, Town Hall	do.
Granite and Slag	Oxenden R.D.C.	C. Burgoine, Council Offices Market Harborough	do.
Surveyor's Stores	Birmingham Corp.	W. S. Till, City Surveyor, Council House, Birham	Feb. 29
*Water Mains	Cromer Waterworks Co. Lim.	J. C. Mellis, 264, Gresham House, Old Broad-st. E.C.	do.
Granite and Slag (14,500 tons)	Spilsby (Lincs.) R.D.C.	Geo. Walker, Council Offices, Spilsby	do.
*Waterworks	Mountmellick Union	T. & H. Turpin, Maryborough, Queen's County	do.
Making-up Silver-street, &c.	Norwich Corp.	A. E. Collins, C.E. Guildhall, Norwich	do.
Rebuilding Upper Mills, Trowbridge, Wilts	.....	Foley, Son, & Mundy, Surv. The Mart, Trowbridge	do.
Surveyor's Materials	Carlisle Corp.	W. Howard-Smith, C.E. 36, Fisher-street	Mar. 2
Drainage Works, Prospect-place, Leeds-road	Eccleshill (Yorks.) U.D.C.	J. Richardson, Council Offices, Eccleshill	do.
Pipe Sewer, Manshafts, &c. Halton	Hastings Corp.	P. H. Palmer, C.E. Town Hall, Hastings	do.
Granite Road Metal	Hinckley (Leicester) R.D.C.	W. D. Bennett, Surveyor, Barwell, Hinckley	do.
*Boundary Walls	West Ham Sch. Bd.	W. Jacques, 2, Fen-ct. E.C.	do.
*Works and Materials	Hornsey U.D.C.	E. J. Lovegrove, Council Offices	do.
*Granite Rag Stone, Lime, &c.	Camberwell Vestry	O. S. Brown, Vestry Hall	do.
*Disinfectants	do.	do.	Mar. 3
*Erection of Lodge and Conveniences	London C.C.	Architect's Dept. County Hall, Spring-gardens, S.W.	do.
*Granite	Middlesex C.C.	County Surveyor, Guildhall, Westminster, S.W.	do.
*Stone Paving	Commrs. of Sewers	The Engineer, Guildhall	do.
Earthenware Pipe Sewers, near Birmingham	Castle Bromwich R.D.C.	J. E. Willcox, C.E. Union Chambers, Birmingham	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c. Supplied by	Tenders to be delivered.
*Sewerage Works (1,100 yards), near Stockport	Disley R.D.C.	H. Bancroft, C.E. 88, Mosley-street, Manchester	Mar. 3
*Levelling, Kerbing, Lighting, &c. Road	Kingston-on-Thames Corporation	Borough Surveyor	Mar. 4
Street Works, Adderley Green, &c.	Cheadle (Staffs) R.D.C.	F. T. Inskip, Surveyor, Brook House, Cheadle	do.
Aberdeen Granite, &c.	South Shields Corp.	M. Hall, Borough Engr.	do.
Additions to Schools, Dudley Port, Staffs	Tipton Sch. Bd.	A. Long, Archt. 319, High-st. West Bromwich	Mar. 5
Road Materials	Bingham (Notts.) Dist. Highway Bd.	R. H. Beanmont, Clerk, Board's Offices	do.
*Erection of School	East Barnet S.B.	W. Pywell, 40, Gt. James-street, W.C.	do.
*Granite	Bournemouth T. C.	Borough Surveyor	do.
Infirmary Buildings, Whiston	Prescot (Lancs.) Union	J. Gandy, Archt. Hall-st. St. Helens	do.
Pipe Sewers, Cortonwood	Rotherham R.D.C.	Wm. Spinks, C.E. 37, Prudential-buildings, Leeds	Mar. 6
Road Material	Castleton (Lancs.) U.D.C.	R. J. Webster, Surveyor, Council Offices	do.
Sixteen Cottages and Offices, Grimethorpe, Yorks	.....	Jno. Robinson, Wombwell, near Barnsley	do.
Additions to West Vale Mills, Halifax		Horsfall & Son, Archt. Lord-st. Chamb. Halifax	do.
Sewers	Barrhead (N.B.) Town Commrs.	A. Stodart, C.E. 79, West Regent-st. Glasgow	Mar. 7
*Private Street Works	Stoke Newington Ves.	S. E. Burgess, Vestry Hall	do.
Police Station, Castleford	West Riding C.C.	J. Vickers Edwards, Coun. Surv. Wakefield	do.
Flint Road Metal	Midhurst (Sussx) R.D.C.	A. G. Gibbs, Surv. Langford House, Midhurst	Mar. 9
*Additions to Asylum	Wilts County Asylum	County Offices, Trowbridge	do.
Road Metal, &c.	Bath U.S.A.	C. R. Fortune, City Surv. Guildhall, Bath	do.
Stoneware Sewer Pipes, &c.	Bath Corporation	do.	Mar. 10
Stoneware Pipe Sewers, &c.	Burnham (Somerset) U.D.C.	W. J. Press, Surv. Town Hall	do.
*Construction of Subway	Burnley Corp.	Borough Surveyor	do.
*Wood Paving	Shoreditch Vestry	T. R. Roscoe, Town Hall	do.
*Works and Materials	Lewisham Bd. of W.	Board of Works Offices, Catford, S.E.	do.
*Erection of Infirmary Buildings	Sunderland Union	W. & T. R. Milburn, 35, West Sunniside, Sunderland	Mar. 17
*Construction of Filter Beds, Gauge House, &c.	Stockton & Middlesbrough Water Bd.	J. Mansergh, 5, Victoria-street, Westminster	Mar. 18
*Engine House, &c. &c. for Waterworks	Gloucester Corp.	W. Fox, 5, Victoria-street, Westminster, S.W.	Mar. 19
*Erection of Buildings for Sewage Sludge	Southampton Corp.	Borough Engineer	Mar. 23
*Widening of Railway between Finchley-road and Wembley	Metropolitan Railway Co.	J. Wolfe Barry, 21, Delahay-st. Westminster, S.W.	do.
Police Station, Newquay, Cornwall	Standing Joint Com.	O. Caldwell, Archt. Victoria-square, Penzance	Mar. 28
*Construction of New Museum for Egyptian Antiquities	Egyptian Government	Offices of the "Service Administratif"	April 13
*Construction of Arabic Museum and Khedivial Library, Cairo	do.	do.	May 2
Granite and Slag (11,500 tons)	Gainsborough R.D.C.	R. Maxwell, Surv. North Marsh-rd. Gainsborough	No date
*Painting and Scraping	Blackpool Tower Co. Lim.	Maxwell & Tuke, 41, Corporation-st. Manchester	do.
Offices, Lee-street, Bacup	Rossendale Union Gas Co.	Smith & Cross, Archt. Town Hall-chambers, Rochdale	do.
Mill Room and Engine House, Berkhamsted	W. Cooper & Nephews	C. H. Rew, Archt. High-street, Berkhamsted	do.
Hartshill Stone	Buckingham R.D.C.	C. J. Varney, Surv. Preston Bissett, Buckingham	do.
Granite Setts (1,300 tons)	Batley Corp.	Hy. Dearden, Boro' Surv.	do.
Restoration, St. John's Church, Nelson, Lancs.	.....	Smith Whitehead, Archt. Nelson	do.
Residence and Stables, Duffield	.....	E. R. Ridgway, Archt. Long Eaton	do.
Additions to Hospital, Riddings-road, Ilkley	.....	C. H. Hargreaves, Archt. Bank-street, Bradford	do.
*Dwelling Houses	.....	W. M. Gilbert, 12, Havelock-road, Hastings	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.
*Draughtsman	Cowes Harbour Com.	.....	Feb. 26
*Two Clerks of Works	Fulham Vestry	3l. 3s. per week	Feb. 29
Clerk of Works	Wallasey U.D.C.	2l. 2s. per week	Mar. 2
*Surveyor, Inspector, and Gas Examiner, Jointly	Broadstairs and St. Peters, U.D.C.	95l. 65l. and 5l. respectively	Mar. 3
Surveyor and Inspector	Gower (Swansea) R.D.C.	175l. per annum	Mar. 7
*Chief Inspector of Nuisances	Hove U.D.C.	165l. per annum, &c.	do.
*Surveyor	Met. Asylums Board	400l. per ann. commencing	Mar. 13

Those marked with an asterisk (*) are advertised in this Number. *Competition, p.* iv. *Contracts, pp.* iv., vi., vii., viii., *&* x. *Public Appointments, pp.* xix., *&* xxi.

FEBRUARY 6.—2,714, J. Dransfield, Chisel for Cutting Stone, Iron, Wood, &c.—2,726, A. Ransom, Chimneys and Ventilating Shafts.—2,729, G. Potts, Sliding Windows.—2,730, G. Potts, Fireplaces.—2,744, H. Lazenby, Window-sashes.—2,746, E. Backholtz, Paving and Paving-blocks.—2,768, J. Hamilton, Reservoir Painting Machine for Painting Sash-bars.—2,776, G. Harvey and J. East, Metal Lathing for Fireproofing Buildings, Ceilings, &c.

FEBRUARY 7.—2,786, M. Adams, Supporting Lavatory Basins, &c.—2,810, S. Abram, Continuous Down-draught Brick Kiln.—2,813, J. Higson, Continuous Firing Kilns.—2,842, G. Kunkler, Device for Holding Scaffold Poles.—2,843, H. Simmonds and J. Delaney, Kilns for Burning Lime, Cement, &c.—2,852, C. Thomas, Brick Kilns.—2,853, F. Holloway, Ventilating and Man-hole Covers for Street Sewers, &c.

FEBRUARY 8.—2,872, L. Seager, Ladders, Trestles, &c.—2,893, G. Brown, jun., Hinging of Sliding Window-sashes.—2,922, R. Pilgrim and J. Pemberton, Machinery for Mixing Mortar.—2,940, W. Hatch and others, Fasteners for Windows, &c.

PROVISIONAL SPECIFICATIONS ACCEPTED.

20,633, T. Davie, Gulley-trap for the Prevention of the escape of Foul Gas from Sewers, and Foul Air-pipe connected thereto.—23,893, J. Kingsmill, Self-acting Window-fastener.—24,863, A. Macpherson, Radiating Back, Covings, or Linings for Fireplaces, &c.—19, J. Mussellwhite, Wood-block Flooring.—660, G. Williams and W. Jackson, Chimney Cowls.—670, F. Cross, Stucco Glass.—1,471, C. Batcock and J. Kenyon, Opening and Closing Ventilators, &c.—1,531, A. Walker, House-bell.—1,541, G. Wylie, Window-sashes.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to opposition for two months.

2,863, G. Brown, Hinges for Sliding Window-sashes, &c.—5,561, W. Bruce, Heating and Ventilation of Buildings.—6,710, G. Smith, Glazing all kinds of Roofs, &c., for Horticultural and other purposes.—6,716, W. Sinclair, Syphon Flushing Cisterns for Water-closets, &c.—7,106, J. Claughton and others, Stair-treads and other Floor-surfaces.—7,243, W. Buck, Fittings for Chimneys, to prevent Down-draught or Smoking.—12,669, C. Jamieson, Pipe-joints.—430, P. Ridelle, Window-sash locks.—628, A. Tiltman, Fireplaces combined with Ventilating-shaft

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

Feb. 3.—By R. LOVE & SON (at Chard).

Wadeford, Somerset.—"Mill Court Field," 14 a. 3 r. 38 p., f. £800

Feb. 4.—By G. TINKER & SON (at Huddersfield).

Kirkburton, Yorks.—House, 18 cottages and 2 closes, 5 a. 1 r. 38 p., f. 510

Feb. 5.—By G. TINKER & SON (at Holmfirth).

Ryecroft, Yorks.—House, 4 cottages and enclosures, 9 a. 0 r. 11 p., f. and c. 753

By SIMMONS & SONS (at Bracknell).

Binfield, Berks.—"The Terrace" and 1 a. 3 r. 4 p., f. 500

An enclosure of land, 3 r. 36 p., f. 275

By E. PENNINGTON (at Richmond).

Richmond Hill.—28, Lancaster-rd., u.t. 89 yrs., g.r. 12l., e.r. 65l. 600

Feb. 6.—By ELGOOD & FULLER (at Stony Stratford).

Stony Stratford, Bucks.—High-st., freehold business premises 200

By R. GREENWOOD (at Haslingden).

Haslingden, Lancs.—Higher-lane Farm, 5 a. 1 r. 33 p., c. 700

1, Higher-lane, c. 110

By W. DEW & SON (at Llangefni).

Amlwch, Anglesey.—"Four Crosses and Pyllau Farm," 204 a. 2 r. 26 p., f. 5,930

Feb. 10.—By RICHARDSON & PEARCE-BROWN (at Selby).

Brayton, Yorks.—House and enclosure of land, 2 a. 1 r. 26 p., f. and c. 423

Feb. 11.—By F. PERKS.

Finsbury.—116 to 122 (even), Clifton-st., f., r. 140l. 2,250

By WESTON & SONS.

Brixton.—1, 3, and 5, Kepler-rd., u.t. 70¼ yrs., g.r. 19l. 10s., r. 88l. 695

6 and 8, Appach-rd., u.t. 69½ yrs., g.r. 16l., r. 68l. 500

Clapham.—87, Fentiman-rd., u.t. 42 yrs., g.r. 8l. 10s., r. 46l. 330

By ALFRED RICHARDS (at Tottenham).

Tottenham.—1 to 23 (odd), Burlington-rd., f., e.r. 28*l.* 16s. 2,200
Edmonton.—2 and 3, Essex Villas, f., r. 45*l.* 10s... 550

By G. TINKER & SON (at Huddersfield).

Huddersfield, Yorks.—Buxton-rd., "The Woolpack Hotel," and house, shop, &c., r. 31*l.* 16s. 6d., renewable every 20 yrs., fine 63*l.* 13s..... 10,400
19 and 21, Buxton-rd., and shop and warehouse adjoining, u.t. 53 yrs., r. 9*l.* 6s., renewable every 20 yrs., with fine 1,600
Victoria-st., warehouse premises, u.t. 985 yrs., g.r. 8*l.* 13s. 8d. 1,610
Quay-st., &c., 5 houses and 10 cottages, u.t. 47 yrs., r. 8*l.* 13s. 6d., renewable every 20 yrs., fine, 17*l.* 7s. 1,650

Feb. 12.—By DREW & SON (at Kingston).

Hampton Wick, Middlesex.—5 and 6, The Terrace, f., e.r. 60*l.* 800

By HOLLAND & ANDREWS (at Chelsea).

Chelsea.—28, Sydney-st., u.t. 29½ yrs., g.r. 6*l.*, r. 65*l.* 535
1, Slaidburn-st., u.t. 58 yrs., g.r. 4*l.* 10s. 140

By S. WOODCOCK (at Stratford).

Stratford.—36, Ashlin-rd., u.t. 91 yrs., g.r. 4*l.* 19s. 275
59, Wingfield-rd., u.t. 88 yrs., g.r. 5*l.* 165

By RUSHWORTH & STEVENS.

Paddington.—95, 97, and 99, Westbourne Pk. Villas, u.t. 40½ yrs., g.r. 30*l.*, r. 160*l.* 975
85 and 87, Westbourne Pk.-rd., u.t. 60 yrs., g.r. 18*l.*, r. 110*l.* 835
110 and 112, Westbourne Pk.-rd., u.t. 40½ yrs., g.r. 15*l.* 620
Walthamstow.—8, The Crescent, u.t. 89 yrs., g.r. 4*l.* 4s. 145

By V. VAUGHAN.

Gravesend, Kent.—Parrock-rd., f.g.r. 10*l.* 10s., reversion in 80 yrs. 260

By RICHARDSON & PEARCE-BROWN (at Selby).

Hambleton, Yorks.—Farmhouse and enclosures, 30 a. 2 r. 29 p., c. 1,535

By W. WEATHERHEAD (at Keighley).

Haworth, Yorks.—"The Hollings Farm," 12 a. 1 r. 2 p., f. 845
2 to 12 (even), Star-st., and 1 to 11 (odd), Moon-st., f. 610
Thornton, Yorks.—Little Kipping-lane, two houses and shops, f. 230

February 13.—STIMSON & SONS.

Notting Hill.—4, Clarendon-rd., u.t. 42 yrs., g.r. 5*l.*, r. 38 *l.* 420
Spitalfields.—17 to 21, Tilley-st., f., r. 156*l.* 1,810
Mile End.—98 to 104 (even), West-st., and 47 to 53 (odd), Essex-st., u.t. 10 yrs., g.r. 22*l.* 2s. 230
Peckham.—18, 18a, and 20, Middle-st., u.t. 57 yrs., g.r. 8*l.* 10s. 220
Brixton.—12 to 15, Ridgway-rd., u.t. 74 yrs., g.r. 18*l.* 670

By NEWBON & CO.

Islington.—119, Shepperton-rd., r. 35*l.*; also i.g.r. 53*l.*, u.t. 12½ yrs., g.r. 23*l.* 370
61, 62, and 63, Popham-rd., and 68 and 70, South-st., r. 261*l.* 10s., also i.g.r. 105*l.* 10s., u.t. 12½ yrs., g.r. 6*l.* 10s. 1,100
Popham-st., i.g.r. 46*l.*, u.t. 24 yrs., g.r. 18*l.* 10s. 290
Clerkenwell.—115, St. John-st., u.t. 14¾ yrs., g.r. 6*l.* 9s., r. 48*l.* 225
23 and 24, Lloyd's-row, u.t. 15½ yrs., g.r. 10*l.*, r. 66*l.* 245
Barnsbury.—40, 46, and 48, Copenhagen-st., u.t. 23½ yrs., g.r. 6*l.*, r. 104*l.* 710
Pentonville.—20, River-st., u.t. 16½ yrs., g.r. 8*l.*, r. 50*l.* 265
Clerkenwell.—1 and 2, Tysoe-st., u.t. 20 yrs., g.r. 20*l.*, r. 73*l.* 365

[Contractions used in these Lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent, r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.

PRICES CURRENT OF MATERIALS.

TIMBER.

Greenheart, B.G. ton	8/0/0	9/0/0
Teak, E.I. ..load	10/0/0	16/0/0
Sequoia, U.S. ft. cn	1/10	2/0
Ash, Canada load	3/5/0	4/10/0
Birch, do.	2/15/0	4/15/0
Elm, do.	4/0/0	5/5/0
Fir, Dantsic, &c.	2/0/0	3/10/0
Oak, do.	2/15/0	4/15/0
Canada	6/10/0	8/0/0
Pine, Canada red	0/0/0	0/0/0
Do. Yellow	2/15/0	5/0/0
Lath, Dantsic, fath	4/10/0	5/10/0
St. Petersburg..	5/0/0	6/10/0
Wainscot, Riga, &c., log	2/15/0	5/0/0
Odessa, crown....	2/15/0	5/0/0
Deals, Finland and 1st 1st 100	7/0/0	8/10/0
Do. 4th & 3rd ..	7/0/0	8/0/0
Do. Riga	7/0/0	8/0/0
St. Petersburg, 1st yellow ...	9/10/0	12/0/0
Do. 2nd yellow	7/10/0	9/0/0
Do. white	8/0/0	9/10/0
Swedish	7/0/0	15/10/0
White Sea....	7/15/0	14/15/0
Canada, Pine 1st	21/0/0	25/0/0
Do. do. 2nd....	16/0/0	17/0/0
Do. do. 3rd, &c.	8/0/0	10/0/0
Do. Spruce, 1st..	9/0/0	10/10/0
Do. do. 3rd and 2nd	6/15/0	7/10/0
New Brunswick	6/0/0	7/0/0
Battens, all kinds	5/0/0	20/0/0
Flooring boards, sq., 1 in. prep. 1st.....	0/9/6	0/14/6
Do. 2nd	0/6/6	0/11/6
Other qualities—	0/4/6	0/7/6
Cedar, Cuba ..ft.	/4	/4½
Honduras, &c.	/3½	/4½
Mahogany, Cuba	/3½	/6
St. Domingo, cargo av.	/3½	1/0
Mexican do. do.	/4	/4½
Tobasco do. do.	/4½	/6
Honduras do. ..	/4½	/6
Box, Turkey ton	4/0/0	15/0/0
Rose, Rio	7/0/0	16/0/0
Bahia	6/0/0	15/0/0
Satin, St. Domingo	0/c/7	0/1/0

TIMBER *continued*.

Satin, Porto Rico	0/0/6	0/1/6
Walnut, Italian....	0/0/3	0/0/7

METALS

Iron—Pig, in Scotland .....ton	2/7/2	0/0/0
Bar, Welsh, in London	5/12/6	5/15/0
Do. do. at works in Wales.....	5/2/6	5/5/0
Do. Staffordshire, in London.....	6/0/0	6/10/0
COPPER—British cake and ingot	48/0/0	48/5/0
Best selected ..	49/10/0	50/0/0
Sheets, strong..	56/0/0	0/0/0
Chili bars	45/1/3	45/6/3
YELLOW M'TAL lb	0/0/4½	0/0/4⅝
LEAD—Pig, Spanish ....ton	11/7/6	0/0/0
English com. brands	11/8/9	11/10/0
Sheet, English, 6 lbs. per sq. ft. and upwards ..	12/10/0	0/0/0
Pipe	12/10/0	0/0/0
ZINC—English sheet .....ton	18/5/0	18/10/0
Vieille Montagne	18/15/0	0/0/0
TIN—Straits.....	60/10/0	61/0/0
Australian.....	61/2/6	61/12/6
English Ingots.	64/10/0	65/0/0
Banca	61/5/0	61/10/0
Billiton	60/10/0	60/15/0

OILS.

Linseed .....ton	19/0/0	19/15/0
Cocoanut, Cochin	26/15/0	0/0/0
Do. Ceylon	22/15/0	0/0/0
Palm, Lagos	22/0/0	0/0/0
Rapeseed, English pale	25/0/0	25/10/0
Do. brown	23/10/0	24/0/0
Cottonseed ref. .	16/15/0	17/0/0
Oleine.....	19/10/0	20/15/0
Lubricating, U.S.	6/6/0	9/6/0
Do. black	4/9/0	6/6/0
TAR—Stockholm barrel	1/0/0	0/0/0
Archangel.....	0/14/6	0/15/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays*. N.B.—We cannot publish Tenders unless authenticated by the name and address of the sender: and we cannot publish lists in which the accepted Tender is below £100, unless in some exceptional cases and for special reasons.]

ABERDARE.—For additions, &c., to "Mount Pleasant" Hotel, Cromaman, for the Ely Brewery Co., Ltd. Messrs. Morgan & Co., architects, Aberdare :—

Jno. Williams	£530 0	R. & A. Llewellyn.....	£494 17
Howel Powell	497 15	Williams & Williams,	
Herbert Jelly	495 0	Cromaman (accepted)	494 0

BRIGHTON.—For additions, &c., to school buildings, Middle-street, for the Brighton and Preston U.D. School Board. Messrs. T. Simpson & Son, architects, 16, Ship-street, Brighton :—

A. Wallis	£2,450 0 0	J. Barnes	£2,017 0 0
J. Longley & Co...	2,221 0 0	Peters & Son	2,011 0 0
G. R. Lockyer	2,093 0 0	W. A. Field & Co...	1,974 14 0
F. T. Wilson	2,087 0 0	Brown & Son,	
W. & T. Garrett ..	2,068 0 0	Brighton*	1,967 7 8

* Accepted.

BRIGHTON.—For the erection of a cookery school at Elm Grove, for the Brighton and Preston School Board, U.D. Messrs. Thos. Simpson & Son, architects, 16, Ship-street, Brighton :—

J. Longley & Co. ...	£1,493 0	W. Brown & Son.....	£1,192 13
A. Wallis.....	1,398 0	Sattin & Evershed	1,165 10
Wm. Taylor	1,285 0	W. Botting & Son,	
G. R. Lockyer.....	1,275 4	Brighton*	1,118 10
V. P. Freeman.....	1,243 0		

* Accepted.

CARDIFF.—Accepted for the erection of the first section of the Cardiff Synagogue, Cathedral-road, Cardiff. Mr. Delissa Joseph, architect, 17 and 18, Basinghall-street, London, E.C. Quantities by Messrs. James & Morgan, Cardiff :—

W. Lissaman, jun., Cardiff £5,164

CHELMSFORD.—For small villa residence on the Hamlet-road. Mr. Rd. Mawhood, architect, Chelmsford :—

Choat & Son	£430 0	W. Samms	£393 0
G. Saltmarsh.....	419 0	J. Gowers*	389 0
W. Fincham	417 10		

* Accepted.
[All of Chelmsford.]

CLACTON-ON-SEA.—Accepted for sea defence works, Clacton-on-Sea. Mr. J. H. Baker, C.E., Clacton-on-Sea :—

B. Cooke & Co., Battersea £3,701

HANLEY.—For alterations to Primitive Methodist schools, Frederick-street, Hanley. Quantities by Messrs. R. Scrivener & Sons :—

C. Cornes.....	£420	G. Ellis	£399
A. Ward	420	T. Godwin.....	380
S. Cartlidge.....	410	C. Smith	375
N. Bennett	399		

HARPENDEN (Herts.).—For new school buildings, for the Harpenden School Board. Mr. A. E. Anscombe, architect, Harpenden :—

	Glazed brick dado.	Extra for Tar paving to play-grounds.	Total.
	£ s. d.	£ s. d.	£ s. d.
T. H. Kingerlee..	4,649 0 0	445 0 275 0 0	5,360 0 0
Sumner & Co.....	4,752 0 0	313 0 276 0 0	5,339 0 0
T. & E. Neville..	4,632 16 0	380 0 274 8 4	5,287 4 4
J. P. White	4,497 0 0	447 0 265 0 0	5,209 0 0
W. G. Dunham ..	4,660 0 0	261 0 284 0 0	5,205 0 0
G. Buckingham ..	4,482 10 0	355 0 266 10 0	5,104 0 0
John Nicks	4,450 18 10	333 0 276 0 0	5,056 18 10
F. Hall	4,418 0 0	360 0 275 10 0	5,054 5 0
J. Willmott & Sons	4,250 0 0	520 0 285 0 0	5,035 0 0
W. E. Shaw.....	4,375 0 0	350 0 275 0 0	5,000 0 0
F. Gough & Co...	4,274 0 0	390 0 270 0 0	4,934 0 0
Dawson & Son ..	4,420 0 0	214 15 262 0 0	4,876 15 0
F. Dupont.....	4,086 0 0	496 0 275 0 0	4,857 0 0
W. Sparrow.....	4,492 0 0	63 10 266 0 0	4,821 10 0
T. H. Coleman ..	4,090 0 0	329 0 253 0 0	4,672 0 0
Scales & Robins	3,947 0 0	370 0 262 0 0	4,579 0 0
G. Brown & Sons	3,897 10 0	344 10 256 15 0	4,498 15 0
J. H. Vickers & Co., Nottingham * ..	3,879 0 0	295 16 257 0 0	4,431 16 0

* Accepted.

LITTLE WALTHAM (Essex). — For new stabling at the "Limes." Mr. R. Mawhood, architect :—

G. Milbank & Son.....	£244	G. Holland, Great Leighs*..	£230

* Accepted.

LONDON.—For the erection of an electric light station, &c., for the Vestry of St. Leonard, Shoreditch. Messrs. Kincaid, Waller, & Manville, engineers, 29, Great George-street, Westminster, S.W. :—

Manlove, Alliott, & Co...	£10,540	Kirk & Randall	£9,442
Nightingale	10,494	Coulsell Bros.	9,383
Shelbourne & Son	10,005	Pattinson & Sons	8,854
Wilkinson Bros.....	9,971	Atherton & Dolman,	
T. Jarvis & Sons	9,926	Poplar *	8,535
T. Chessum & Sons	9,449		

* Accepted.

LONDON.—For alterations, additions, and fittings at the "Earl of Wakefield" public-house, Katherine-road, East Ham, for Mr. J. T. Jones's executors. Mr. Fred. A. Ashton, architect, 3, Crooked-lane, E.C. :—

	Building.	Fittings.	Total.
Hearle & Farrow	£2,380	£779	£3,159
J. & H. Cocks.....	2,105	680	2,785
Wall & Co.	2,092	651	2,743
W. Shurmur.....	2,045	696	2,741
J. Bentley.....	2,118	602	2,720
W. Watson	2,020	680	2,700

LONDON.—For pulling down and erecting two houses at Maidstone-terrace, Point Hill, Greenwich, according to plans by Mr. R. A. Cawe, architect, for C. J. M. L. Lowes, of New Cross :—

H. L. Holloway	£1,180	Scowen*	£800
Ward	900		

* Accepted.

LONDON.—Accepted for reinstating premises after fire at 65, Queen's-crescent, Haverstock Hill, for Mr. Houston. Messrs. James Lewis & Co., surveyors, 6, Southampton-buildings, W.C. :—

Diamond & Porter £470

LONDON.—For the erection of new bottling stores, at the "Crescent Arms Tavern," Southampton-street, Camberwell, for Mr. W. J. Huxley. Mr. W. F. Potter, architect :—

E. G. Browning & Co.....	£287	H. Eames, Peckham *	£210
F. Dawes.....	225		

* Accepted.

LONDON. — Accepted for raising the river-wall at North Woolwich Gardens, and erecting a flank wall, for the London County Council :—

G. Munday & Son £531

LONDON.—For forming two shops in Droon's-road, Bromley, for Messrs. James. Mr. Herbert Riches, architect :—

Robey	£319	Elkington	£255
Verlinder	289	R. Coles*	233

* Accepted.

LONDON.—For alterations and additions to house and stables at "Longmead," Champion Hill, for Mr. P. Dencke. Mr. E. A. Gruning, surveyor :—

Coles & Son	£814 0	Laing & Son.....	£676 10
J. Kinninmont & Sons ..	777 0		

LONDON.—Accepted for engine-house and buildings and kilns, for the Hartridge's Smokeless Fuel Co., Ltd., Ransome's Dock, Park-road, Battersea. Mr. E. Dru-Drury, architect, 25, Queen Ann's Gate, Westminster :—

B. Cooke & Co., Battersea £3,100

MERTHYR TYDFIL.—For widening, &c., High-street, for the Urban District Council. Mr. T. F. Harvey, engineer, Council Offices, Merthyr :—

H. A. S. Fraser	£864 5 0	Batchelor & Snowdon	£684 7 4
D. Jones	844 0 0	Jno. Preece	635 1 1
W. L. Meredith.....	769 8 0	E. H. Page, 11, Castle-street, Cardiff*	582 3 3
Jno. Williams	685 5 0		

* Accepted.

MIDDLETON (Lancs.).—For sewering, draining, levelling, &c., Mills Hill-road, for the Corporation. Mr. W. Welburn, Borough Surveyor, Town Hall, Middleton. Quantities by Borough Surveyor :—

E. Heathorn	£2,978 12 7	F. Kershaw	£2,424 10 9
Thomas Smart.....	2,480 13 6	E. Partington & Sons	2,154 8 11
Geo. Freeman.....	2,480 8 2	Thos. Kilburn, Bolton (accepted)	2,057 5 6
John Ainscouth	2,449 15 10		

[Borough Surveyor's estimate, £2,453 7s. 2d.]

PENZANCE (Cornwall).—Accepted for the erection of a studio, The Lizard, for Mr. Claude M. Hart, of Polbrean, The Lizard. Mr. Robert Collier, architect, of 30, Lincoln's Inn Fields, London :—

Masonry.—Odger Eva, Penrose-road, Helston £125
Carpentry.—J. H. Hill, Mount's Bay House, The Lizard 80

PETERBOROUGH.—For alterations, &c., to the "Burlington, Cowgate, for Messrs. C. F. Thomson & Co. Mr. J. G. Stallebrass, architect, North-street, Peterborough :—

Jellings	£463 0 0	Swain	£335 0 0
Pape	380 0 0	Nichols	330 11 0
Cracknell.....	360 0 0	Guttridge	325 0 0
Furniss Bros.....	359 0 0	Wenlock	314 17 6
Bailey.....	350 0 0	Gray	308 0 0
Sibley.....	350 0 0	Colls*	269 0 0
Clare & Spriggs.....	346 10 0		

* Accepted.
[All of Peterborough.]

SALE.—For the execution of road-works, Thorn-grove, for the Urban District Council. Mr. A. G. McBeath, Engineer, 4, School-road, Sale. Quantities by Engineer :—

H. Walmsley	£250 13 0	George Bozson, Ashton-on-Mersey*	£179 8 10
A. E. Smith	235 17 6		
John Burnham	196 16 8		

* Accepted.

SHERINGHAM (Norfolk).—For the execution of drainage works, for the Erpingham Rural District Council. Mr, R. M. Parkinson, Engineer, Queen-street, Peterborough :—

Baker	£3,063	Bardell	£2,201
Adams	2,511	Porter	2,188
Wilson	2,474	Hipwell	2,133
Youngs	2,428	B. Cooke & Co., Battersea*	2,092
Botterill.....	2,246	Rackham	1,963

* Accepted.

SOUTHAMPTON.—For the execution of the sewerage works, West Quay district, for the Corporation. Mr. W. B. G. Bennett, Borough Surveyor, Municipal Offices, Southampton :—

W. Hill & Co.	£4,496 0	C. Daysh.....	£3,593 0
Jenkins & Sons.....	3,975 0	Roe & Grace.....	3,589 19
F. Osman.....	3,919 10	Crook & Batten	3,575 7
B. Cooke & Co.	3,755 0	H. W. Bull	3,575 0
Playfair & Toole	3,732 0	W. H. Saunders & Co.	3,279 0

THORNTON HEATH.—Accepted for the Thornton Heath drainage. Mr. J. Walker, Borough Surveyor, Croydon :—

B. Cooke & Co., Battersea £4,685

TREHARRIS (Wales).—For the erection of from twenty to forty cottages, Llwyncelyn Estate, Nelson, for the Llwyncelyn Building Club. Mr. J. M. Williams, architect, Quakers'-yard :—

E. Williams	£195 0 0	W. Games ..... W. Budding	£155 0 0
Phillips & Jones.....	189 0 0	J. Bowen	153 0 0
W. Morris	179 15 0	E. E. Nelson	150 0 0
W. Morgan.....	171 0 0	J. C. Richards, Pontypridd *	149 0 0
John Rees	169 10 0	G. H. Leonard	137 10 0
J. & T. Parry	164 18 5	D. Lewis	117 10 0
S. Chibbens.....	160 0 0		
S. Hawkins	159 10 0		

* Accepted.

UPPER WARLINGHAM (Surrey).—For alterations and additions to "The Whyteleafe" Tavern, for Messrs. Page & Overton, Limited. Mr. A. Broad, architect, 3, High-street, Croydon. Quantities by the architect :—

Hanscomb & Smith	£398 10	D. W. Barker	£322 0
S. Page	392 0	W. Smith & Son	311 0
J. Quittenton.....	374 0	S. J. Evans.....	282 18
E. J. Saunders	367 0	Bryant & Cheeseman ..	272 10
E. P. Bulled & Co.....	349 0	Pearson & Co., Croydon*	271 0

* Conditionally accepted.

WIDNES.—For the supply of wrought-iron fencing to enclose the cemetery, for the Corporation :—

	For hollow bars.	For solid bars.
G. B. Smith & Co.	£580 15 0	£467 15 0
R. White & Sons	532 15 3	536 10 9
Hill and Smith.....	515 0 6	503 3 6
E. C. & J. Keay, Ltd.....	518 14 0	500 18 6
T. W. Palmer & Co.....	457 7 6	564 12 6
W. H. Smith & Co.	466 19 0	526 19 0
Bayliss, Jones, and Bayliss.....	464 4 3	482 9 9
David Rowell & Co.....	424 3 9	547 12 3
E. J. Raybould & Co., Workington*	390 3 6	422 6 0

* Accepted.

WOODHALL SPA.—For the erection of chapel and schools at Woodhall Spa, Lincoln. Mr. R. A. Cawe, architect :—

Scowen	£825 0	Cromwell*	£752 1
Bulton	790 0		

* Accepted.

LONDON SCHOOL BOARD TENDERS.

THE following lists of tenders were submitted by the Works Committee to the London School Board at their meeting on the 13th inst. :—

CHELSEA (Star-lane).—Enlarging and rebuilding offices, all departments, and providing additional lavatory accommodation and new drainage scheme :—

G. Neal	£2,295	B. E. Nightingale	£2,166
W. Hammond	2,256	W. Downs	2,130
R. P. Beattie	2,227	G. Foxley	2,110
H. Mallett	2,220	Lathey Bros.	2,093
G. Lyford	2,190	J. Garrett & Son*	1,840
R. A. Yerbury & Sons	2,175	* Accepted.	

CHELSEA (Westville-road).—Erecting laundry centre and removing and refixing infants' covered playground :—

R. A. Yerbury & Sons	£1,154 0 0	Lathey Bros.	£1,012 0 0
J. Christie	1,138 11 0	G. Neal	969 0 0
F. Gough & Co.	1,074 0 0	G. Lyford	933 0 0
D. Charteris	1,058 0 0	I. Garrett & Son	886 0 0
F. T. Chinchen	1,042 7 8	T. Nicholson*	864 0 0
		* Recommended for acceptance.	

EAST LAMBETH (Credon-road).—Erecting laundry centre, and executing sundry works to site :—

W. Downs	£1,091 0	Holliday & Greenwood	£1,012 0
E. Triggs	1,091 0	J. Otway	1,011 0
W. V. Goad	1,089 0	J. Garrett & Son	996 0
W. & H. Castle	1,075 3	Maxwell Bros., Ltd.	842 0
W. Akers & Co.	1,035 0	Peacock Bros.*	818 0
J. Marsland	1,014 0	* Recommended for acceptance.	

FINSBURY (Chequer-alley).—Providing and fixing independent boiler, and hot-water radiators, and connecting up hot-water and gas radiators, thus forming small apparatus for auxiliary warming :—

Z. D. Berry & Sons	£414	Matthews & Yates, Ltd.	£276
W. G. Cannon & Sons	388	J. F. Clarke & Sons	201
W. J. Fox	317	J. Defries & Sons, Ltd.*	185
		* Accepted.	

FINSBURY (Hargrave Park).—Enlargement : Boys, 144 ; girls, 144 ; infants, 114 ; total, 402. The plans include the following works :—Halls, cloak-rooms, lavatories, teachers' room, stock-rooms, and covered playgrounds for all departments ; additional water-closets for boys and girls ; art-room over the hall ; schoolkeeper's house and cookery centre under ; and drainage scheme :—

T. J. Green	£18,522	W. Shurmur	£16,470
R. A. Yerbury & Sons	18,241	E. Lawrance & Sons	16,382
C. Miskin	17,269	L. H. & R. Roberts	16,334
Killby & Gayford	17,183	C. Cox	16,263
G. E. Wallis & Sons	16,880	J. Grover & Son	16,237
W. M. Dabbs	16,658	Treasure & Son	16,121
J. & M. Patrick	16,544	J. Shillitoe & Son*	15,945
Dove Bros.	16,520	* Recommended for acceptance.	

FINSBURY (Winchester-street).—Providing and fixing low-pressure hot-water apparatus for enlargement, extending apparatus to main building, and re-arranging boiler for Infants' department :—

W. G. Cannon & Sons	£550 0	Purcell & Nobbs	£393 0
J. F. Clarke & Sons	522 0	J. Fraser & Son	389 0
Jones & Attwood	508 0	J. Defries & Sons, Ltd. (accepted)	309 0
J. C. & J. S. Ellis, Ltd.	479 10		

GREENWICH (Conway-road).—New school : Boys, 414 ; girls, 414 ; infants, 414 ; total, 1,242. With schoolkeeper's house and manual training centre :—

Lathey Bros.	£24,973	J. Longley & Co.	£23,098
B. E. Nightingale	24,809	Kirk & Randall	22,643
Hart Bros.	24,539	E. Lawrance & Sons	22,542
W. Pattinson & Sons	24,010	I. Shillitoe & Son	22,352
L. H. & R. Roberts	23,593	G. E. Wallis & Sons	21,967
W. M. Dabbs	23,292	Holliday & Greenwood*	21,577
J. & M. Patrick	23,137	* Recommended for acceptance.	

GREENWICH (Old Woolwich-road).—Erecting cookery centre, and enclosing, draining, and tar-paving additional land :—

E. Proctor	£1,279 0 0	W. Akers & Co.	£1,168 12 4
Jas. Smith & Sons	1,198 0 0	J. Kiddle & Son	1,042 0 0
Kirk & Randall	1,122 0 0	J. Otway*	999 0 0
J. & M. Patrick	1,278 0 0		
	* Recommended for acceptance.		

GREENWICH (Plumstead-road). — Providing higher standard rooms on arches, with covered playground for boys under :—

Johnson & Co.	£2,956 0 0	Mid-Kent Building and Contracting Works, Ltd.	£2,720 6 4
Atherton & Dolman	2,832 0 0	J. & M. Patrick	2,656 0 0
B. E. Nightingale	2,819 0 0	Kirk & Randall	2,613 0 0
E. Proctor	2,819 0 0	J. & C. Bowyer	2,609 0 0
Jas. Smith & Sons	2,791 0 0	Jas. Longley & Co.*	2,518 0 0
E. P. Bulled & Co.	2,754 0 0		
Staines & Son	2,752 0 0		
	* Recommended for acceptance.		

HACKNEY (Bonner-street).—Erecting schoolkeeper's house with laundry centre under, and closing, draining and tar-paving additional land :—

W. Gregar & Son	£1,939 0	McCormick & Sons	£1,798 0
J. Willnott & Sons	1,588 0	Staines & Son	1,787 0
Dove Bros.	1,970 0	George Munday & Sons	1,762 0
Johnson & Co.	1,920 10	Charles Cox	1,747 0
L. H. & R. Roberts	1,842 0	W. Shurmur	1,692 0
Killby & Gayford	1,811 0	Treasure & Son	1,684 0
J. Grover & Son	1,803 0	E. Lawrance & Sons*	1,647 0
	* Recommended for acceptance.		

GREENWICH (Royal Hill Site).—Removing two iron buildings from the Fossdene-road Site and refixing them on this site :—

E. Proctor	£576 0	Humphreys, Ltd.	£382 0
Alex. Martin	462 0	W. Harbrow (accepted)	357 10
Kirk & Randall	450 0		

SOUTHWARK (Midway-place).—Providing and fixing Kindergarten gallery, and stepped flooring in infants' department :—

W. Downs	£153	H. Line	£118
Wake & Dean	123	J. Marsland (accepted)	99

TOWER HAMLETS (Oban-street). — Providing small steam-pump with cylinder to supply boiler ; casing mains with composition and providing additional heating surface :—

Z. D. Berry & Sons	£330 0	I. & F. May	£159 0
W. G. Cannon & Sons	315 0	John Fraser & Son*	118 10
Fraser & Fraser, Ltd.	174 0	* Accepted.	

TOWER HAMLETS (Trafalgar-square).—Rebuilding offices, all departments, and new drainage scheme. Removing and refixing covered playground, and draining and tar-paving additional land :—

G. S. S Williams & Son	£3,165	Vernall, Danes, & Co.	£2 939
Dent & Hellyer	3 150	J. & C. Bowyer	2,897
W. Akers & Co.	3,135	E. Triggs*	2,725
Geo. Munday & Son	3,004	* Accepted.	

WEST LAMBETH (Cormont-road).—New school : Boys, 298 ; girls, 298 ; infants, 298 ; total, 894. With schoolkeeper's house :—

R. A. Yerbury & Sons	£24,817	C. Cox	£19,542
Lathey Bros.	21,482	E. Lawrance & Sons	19,363
B. E. Nightingale	21,150	Hart Bros	19 122
J. Grover & Son	21,040	Treasure & Son	18,909
W. Pattinson & Sons	23,702	W. Downs	18,841
D. Charteris	2 ,657	G. E. Wallis & Sons	18,834
T. L. Green	20,228	Holliday & Greenwood *	18,601
Jas. Longley & Co.	19,965	* Recommended for acceptance.	

WEST LAMBETH (Priory-grove).—Providing and fixing Kindergarten gallery, &c., in infants' department :—

G. Wood & Co.	£103 0 0	R. Harding & Son	£66 13 6
J. Garrett & Son	76 0 0	Maxwell Bros, Ltd. *	64 0 0
E. Triggs	72 12 0	* Accepted.	

WEST LAMBETH (St. Andrew's-street)—Erecting Laundry centre :—

Maxwell Bros., Lim.	£1,080	B. E. Nightingale	£936
Holloway Bros.	1,001	Lathey Bros.	823
W. V Goad	947	J. Marsland	820
W. Downs	900	J. Garrett & Son	799
G. Neal	851	E. Triggs *	738
W. Hammond	836	* Recommended for acceptance.	

GAS MAINS AND FITTINGS (Running Contract).—Tenders have been obtained for the general supply of gas mains and fittings for new schools and enlargements, &c , and also for carrying out repairs to existing schools. These tenders were submitted on printed schedules containing a specification of each kind of article required, and, in order to make a comparison of the prices of the articles which are necessarily very numerous, the cost of these articles has been calculated for a typical school (viz., that of the Millfields-road School), on the prices of each of the firms tendering, the result being as follow :—

W. G. Cannon & Sons	£319 6 11	Stevens & Sons	£248 1 4
J. F. Clarke & Sons	264 18 3	J. Defries & Sons, Ltd. (accepted)	226 3 3
J. C. Christie*	249 12 11		
	* Incomplete tender.		

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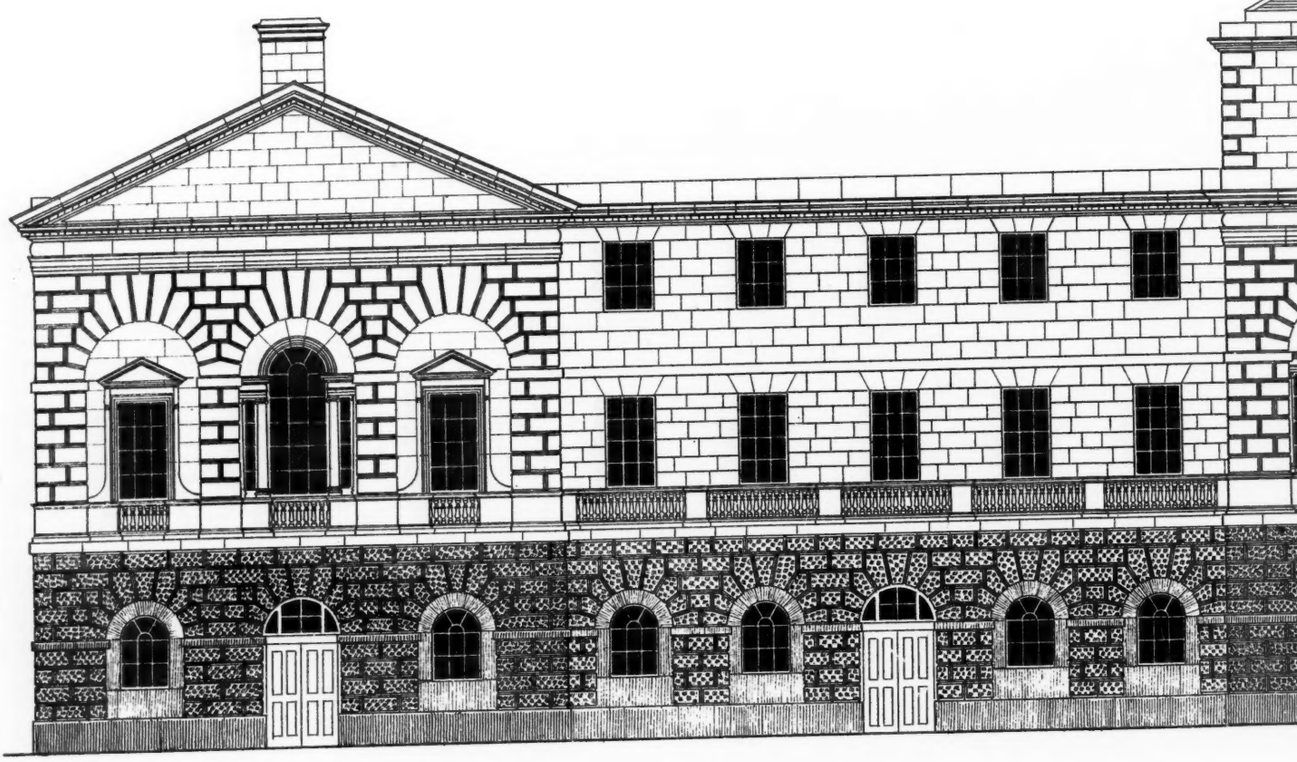

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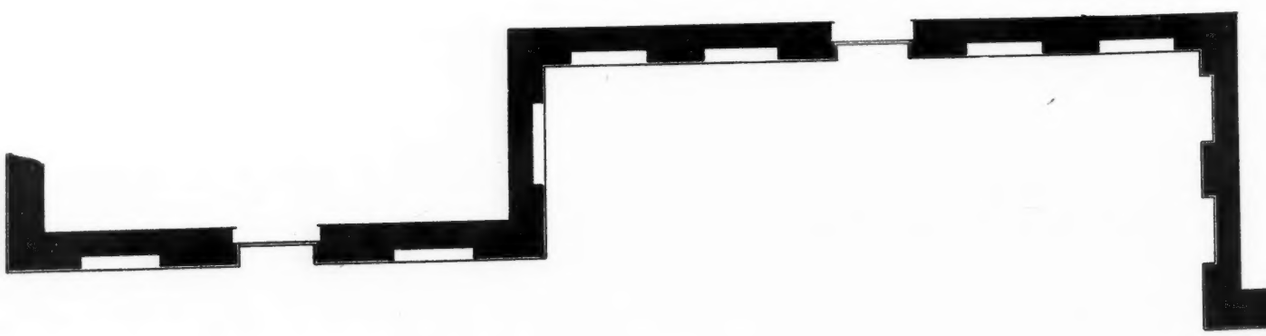
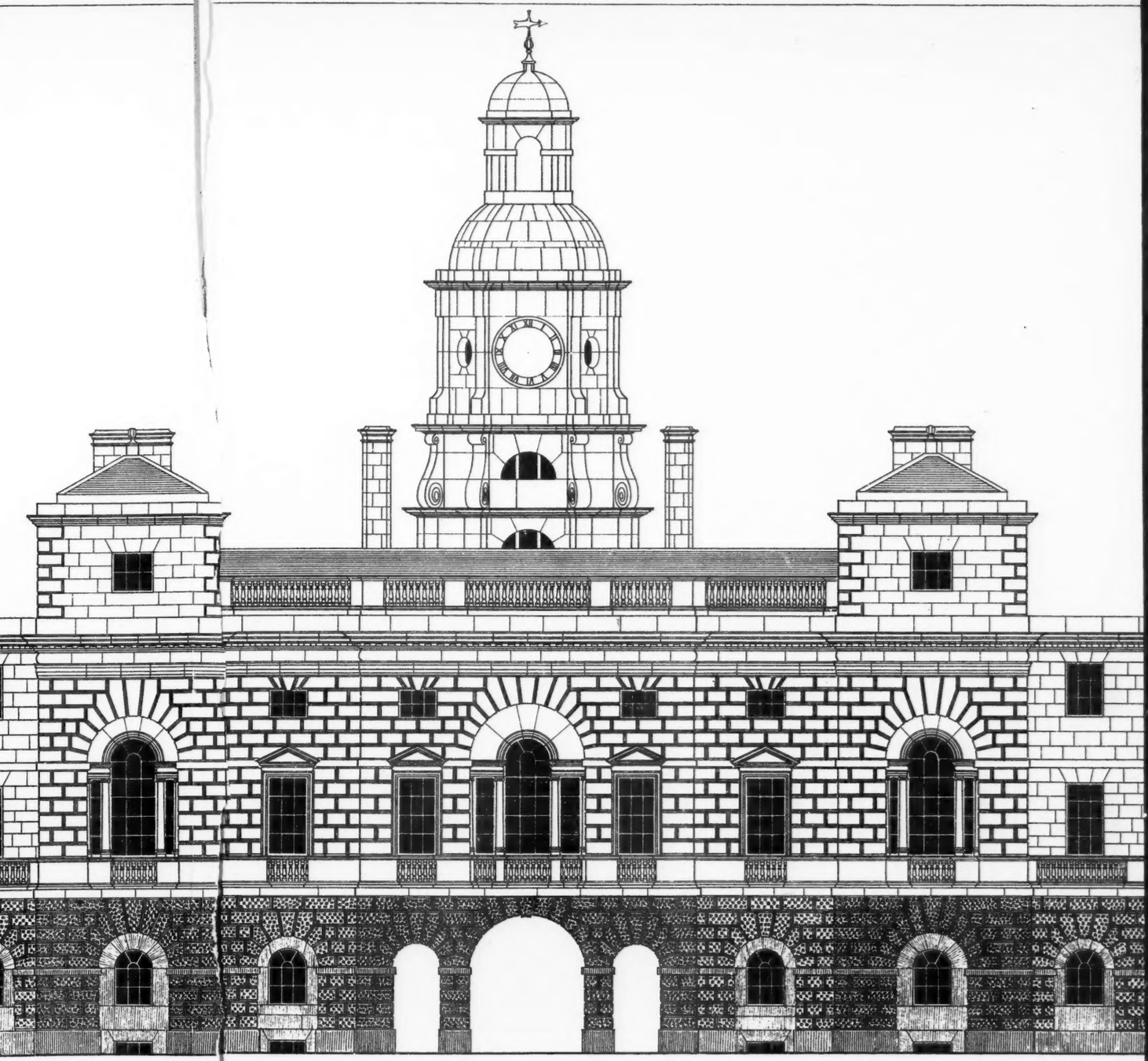
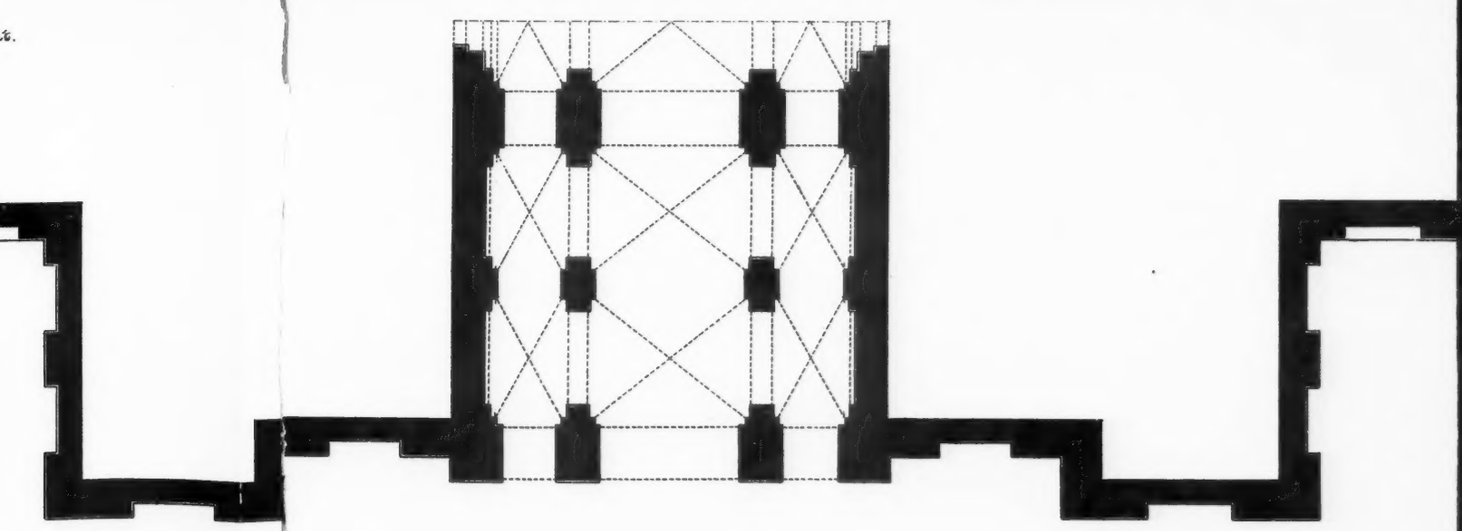


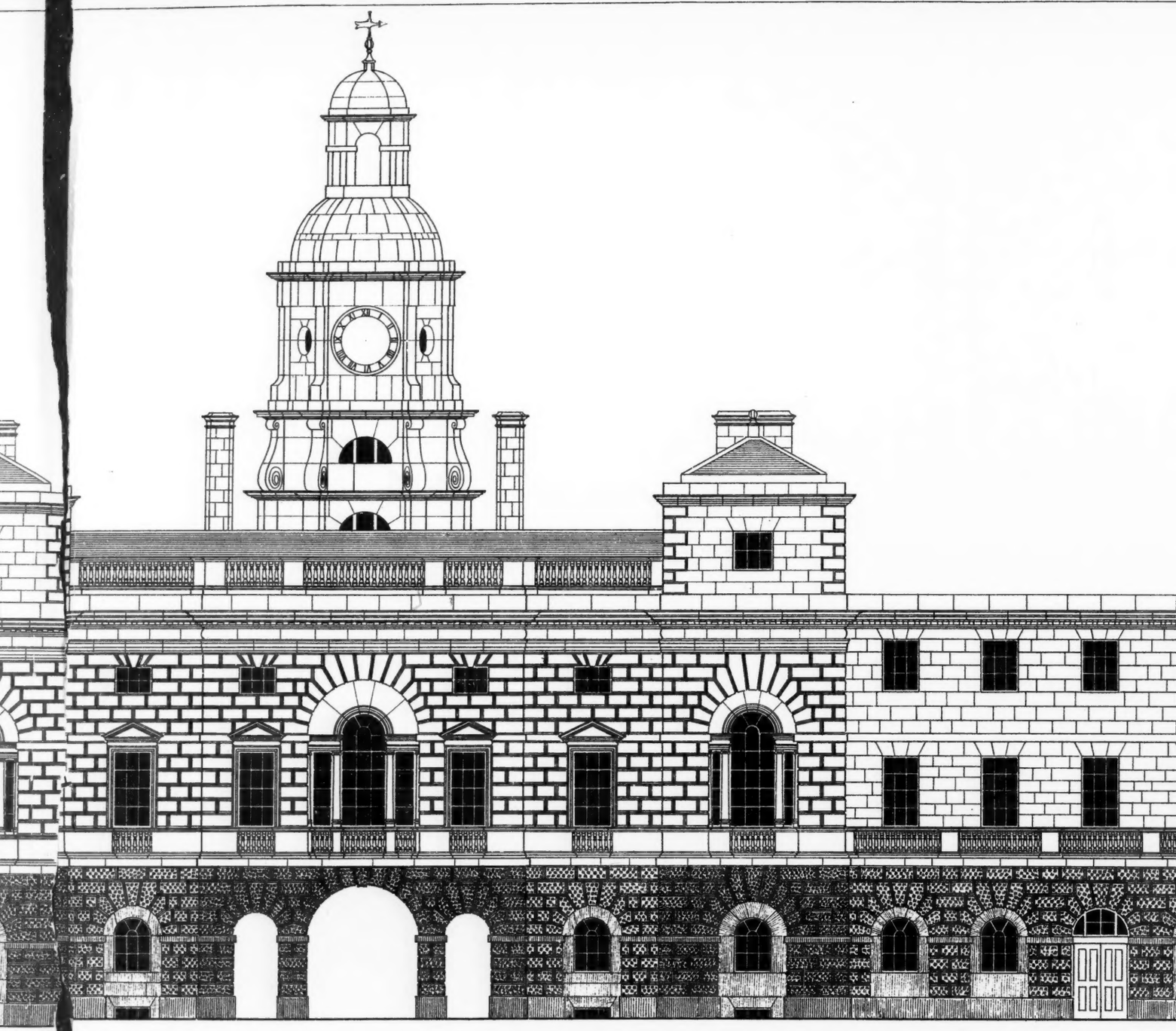


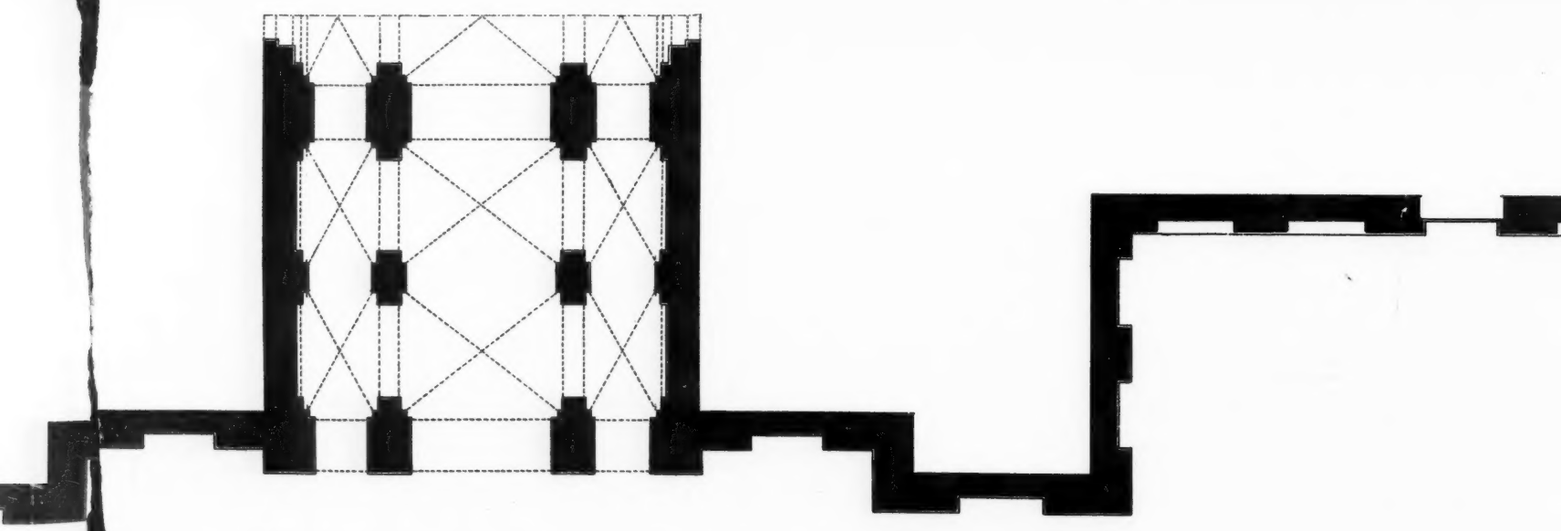


PLAN AND ELEVATION OF WEST FRONT

PART ELEVATION OF THE HORSE GUARDS.—DESIGNED BY W. KENT: 1742-52

MEASURED AND DRAWN BY MR. A. HASWELL CHRISTIE





AND ELEVATION OF WEST FRONT

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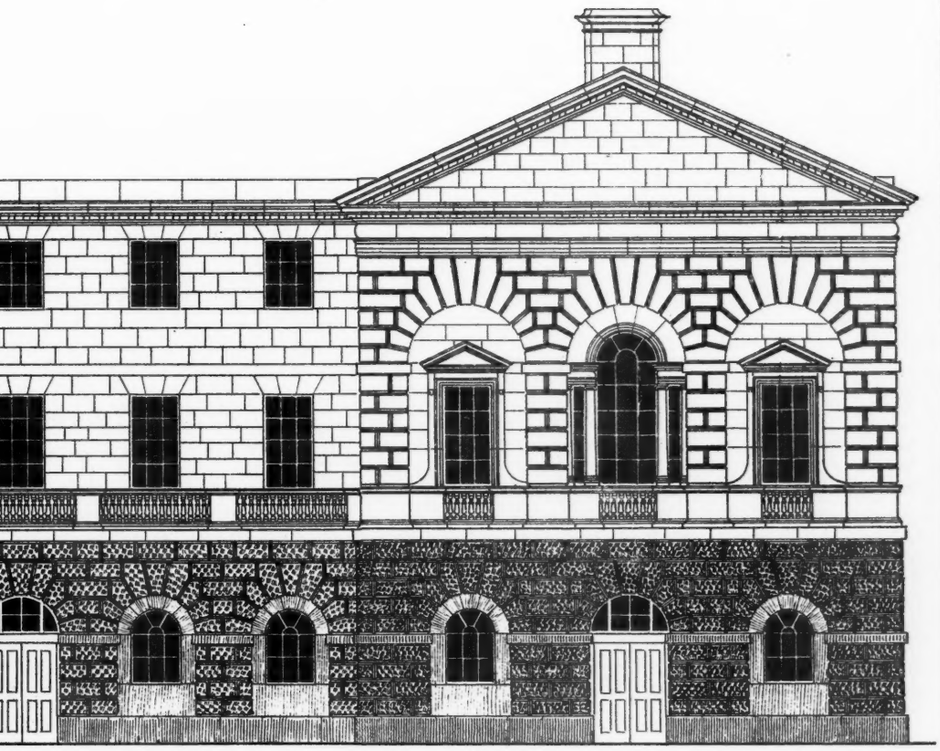


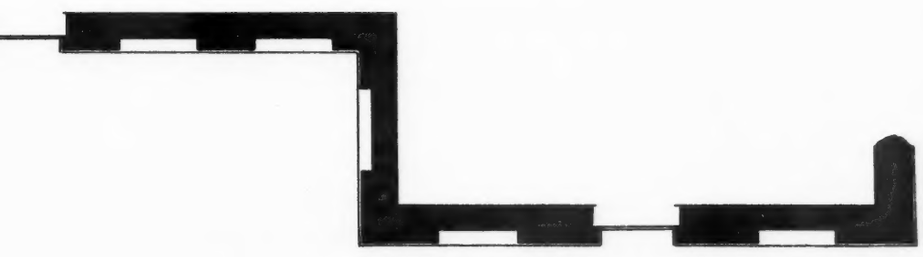
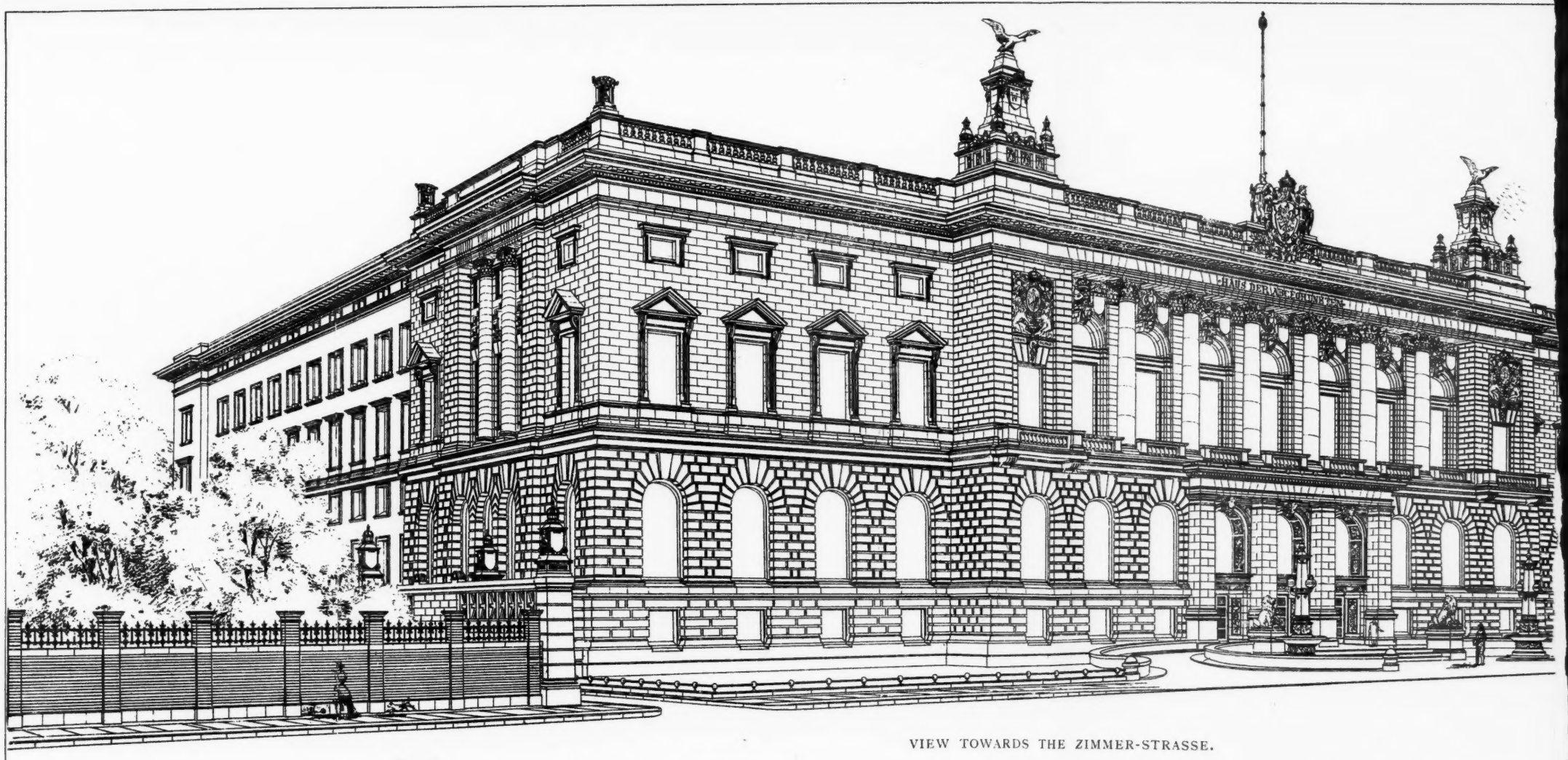
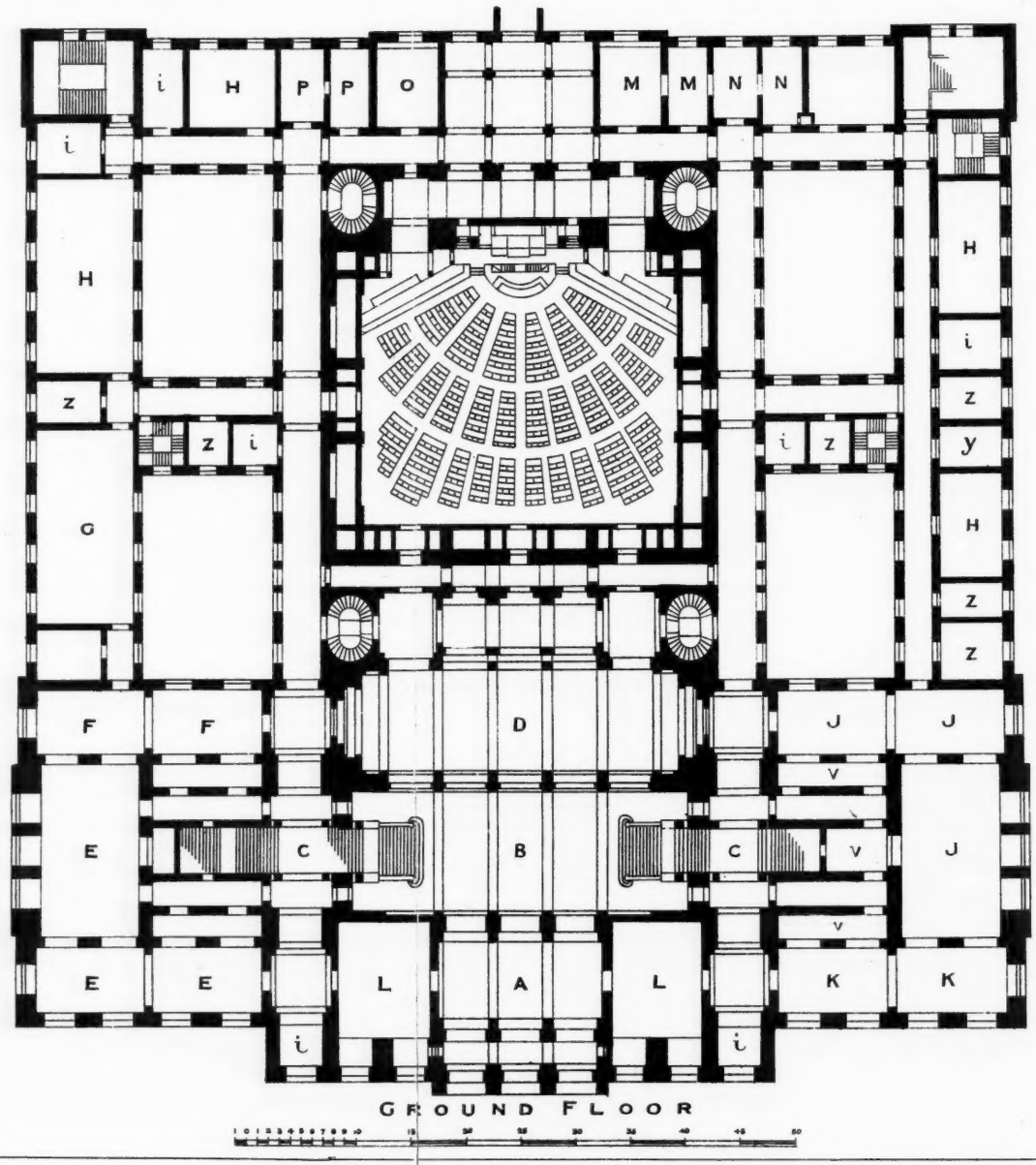


PHOTO-LITHO. SPRAGUE & Co. 4 & 5 EAST HARDING STREET, FETTER LANE, E.C.



VIEW TOWARDS THE ZIMMER-STRASSE.



Reference to Plans.

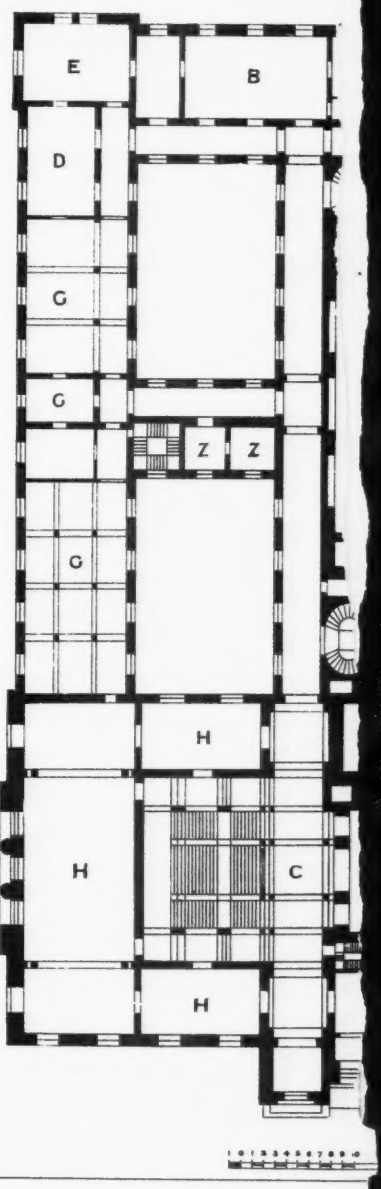
Ground Floor.

A. Grand Vestibule.
B. Hall.
C. Grand Staircase.
D. Grand Lobby.
E. Reading Room.
F. Reference Library.
G. Loan Library.
H. Committee Rooms.
J. Refreshment Rooms.
K. Dining Rooms.
L. Writing Rooms.
M. Chairman's Chambers.
N. Chairman's Office.
O. Special Waiting Room.
P. Secretary's Office.

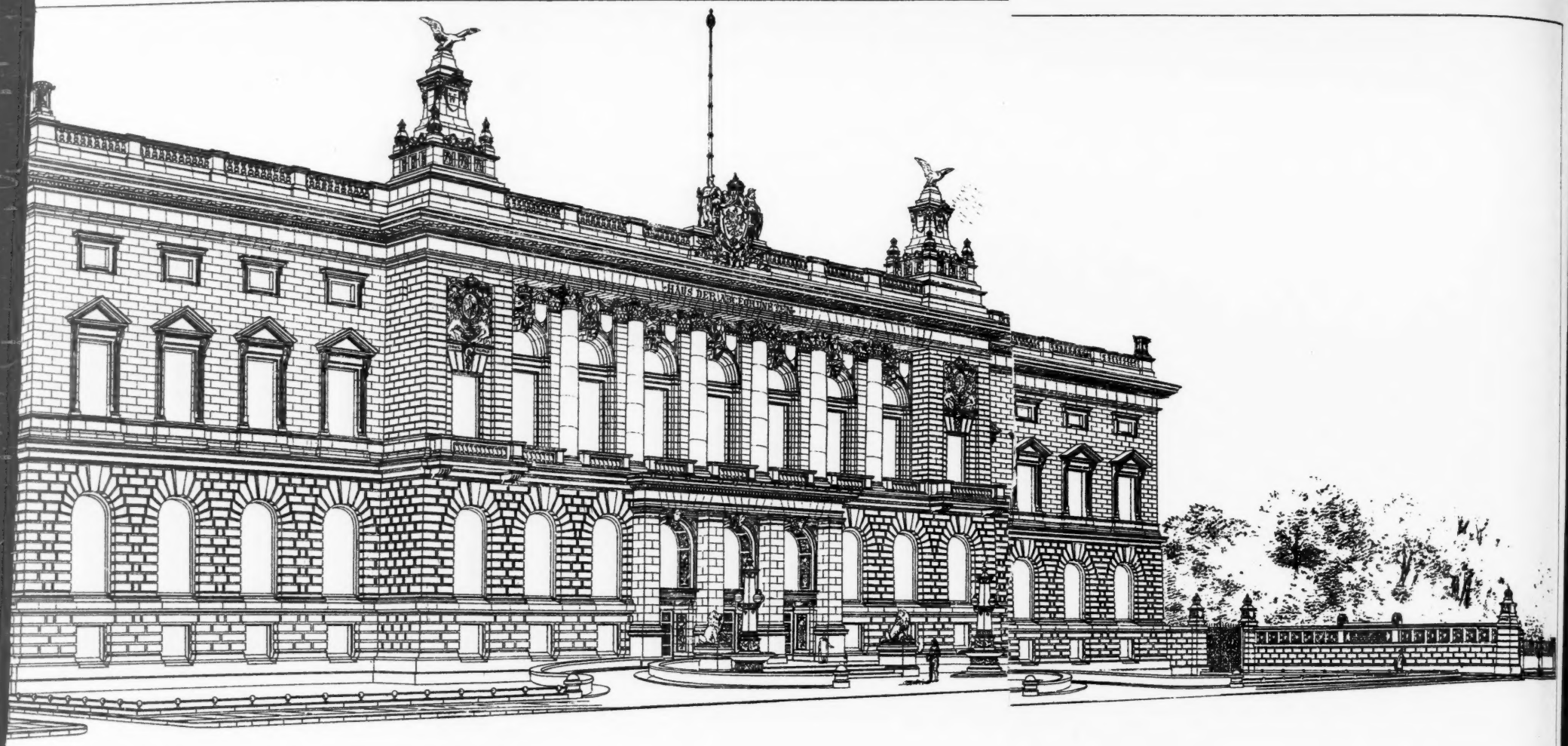
i. Waiting Rooms.
v. Service.
y. Dressing Rooms.
z. Lavatories.

First Floor.

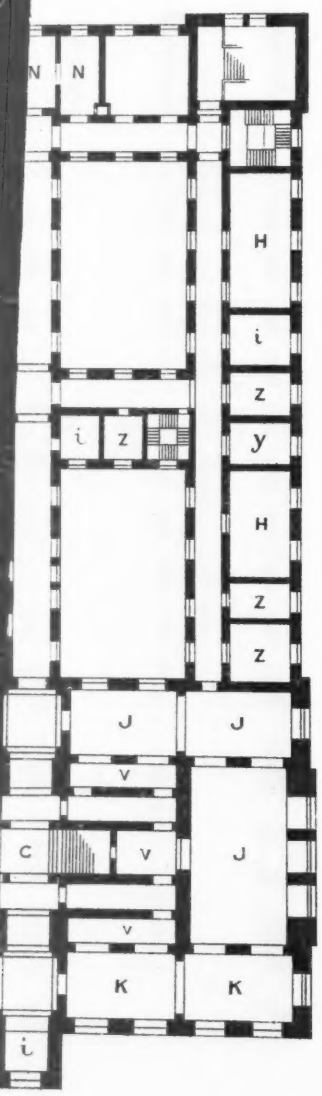
A. Grand Vestibule.
B. Offices.
C. Grand Staircase.
D. Newspaper Room.
E Special Work Room.
F. Council Chamber.
G. Loan Library.
H. Committee Rooms.



PALACE OF THE PRUSSIAN DIET, BERLIN.—Herr Friederich Schulze, Architect.



VIEW TOWARDS THE ZIMMER-STRASSE.



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P. Secretary's Office.

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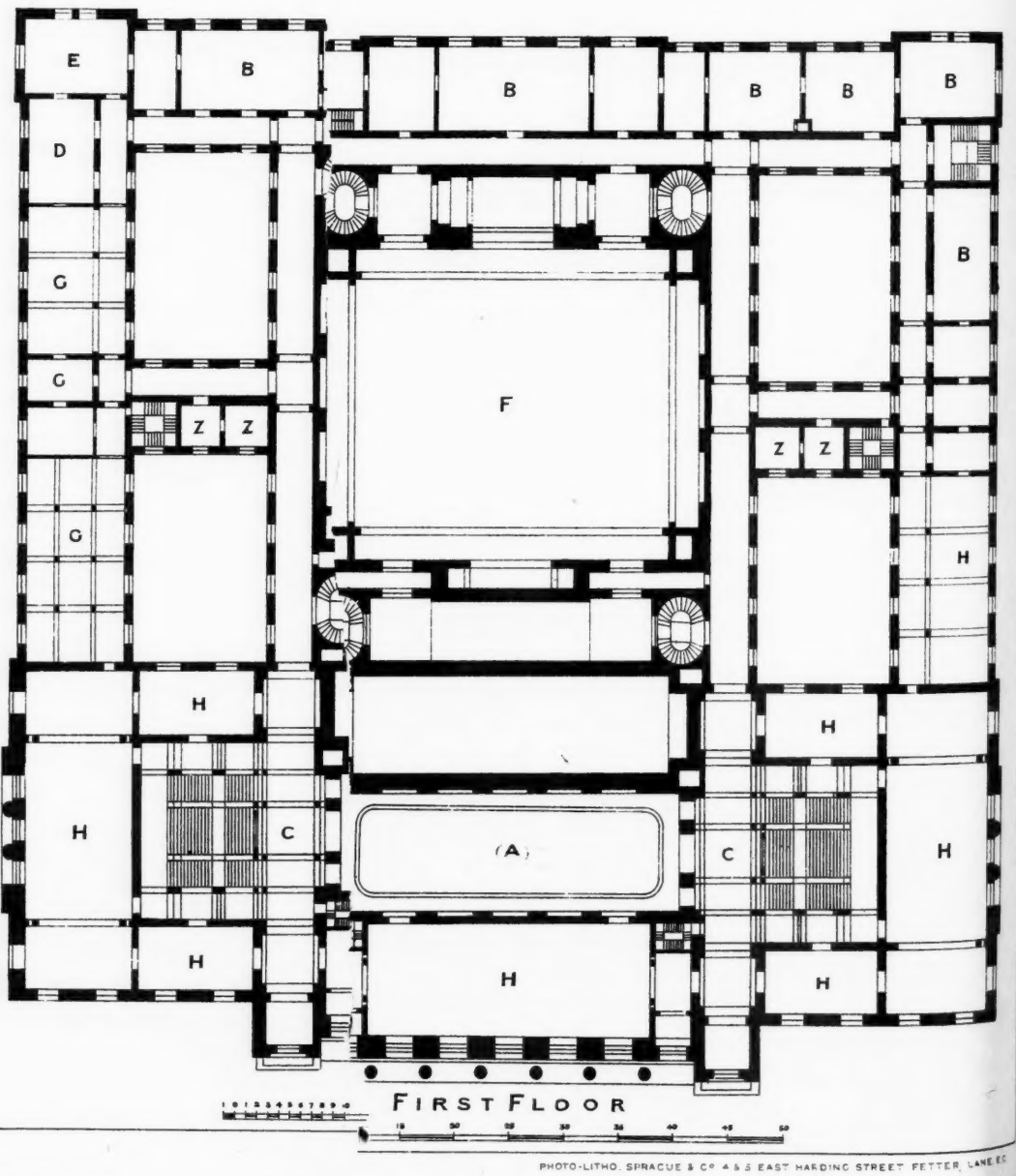

PALACE OF THE PRUSSIAN DIET, BERLIN.—Herr Friederich Schulze, Architect.

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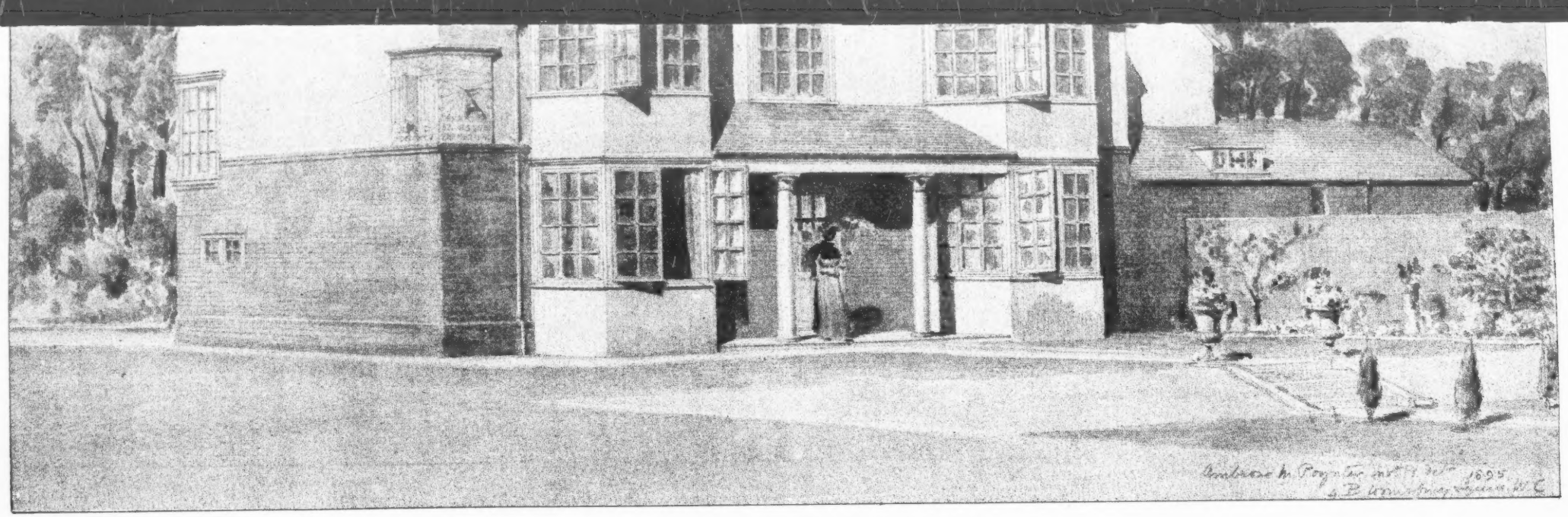
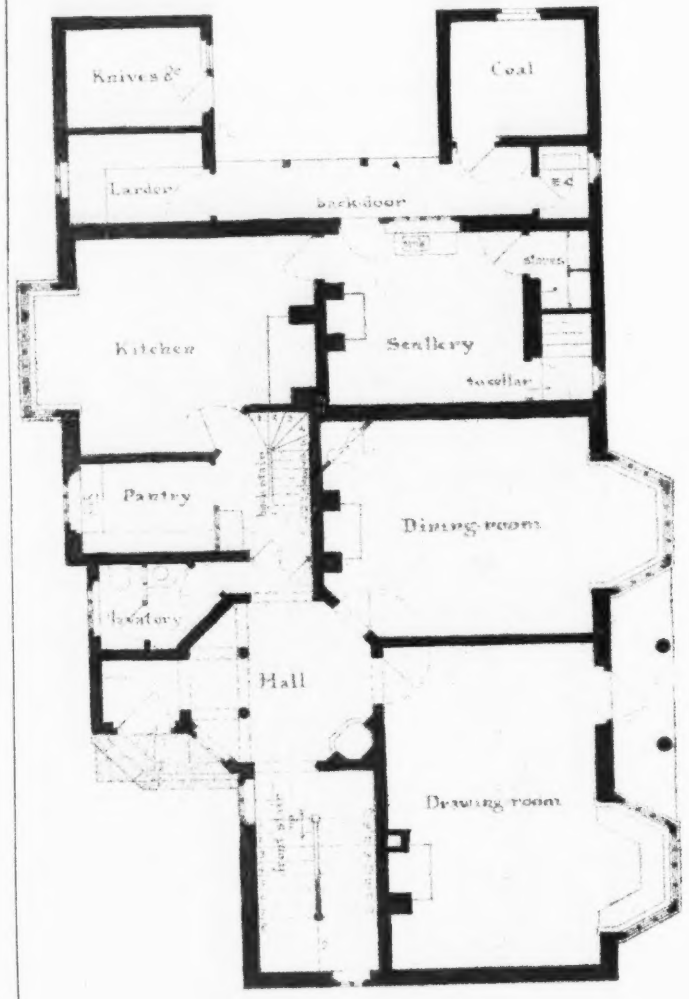
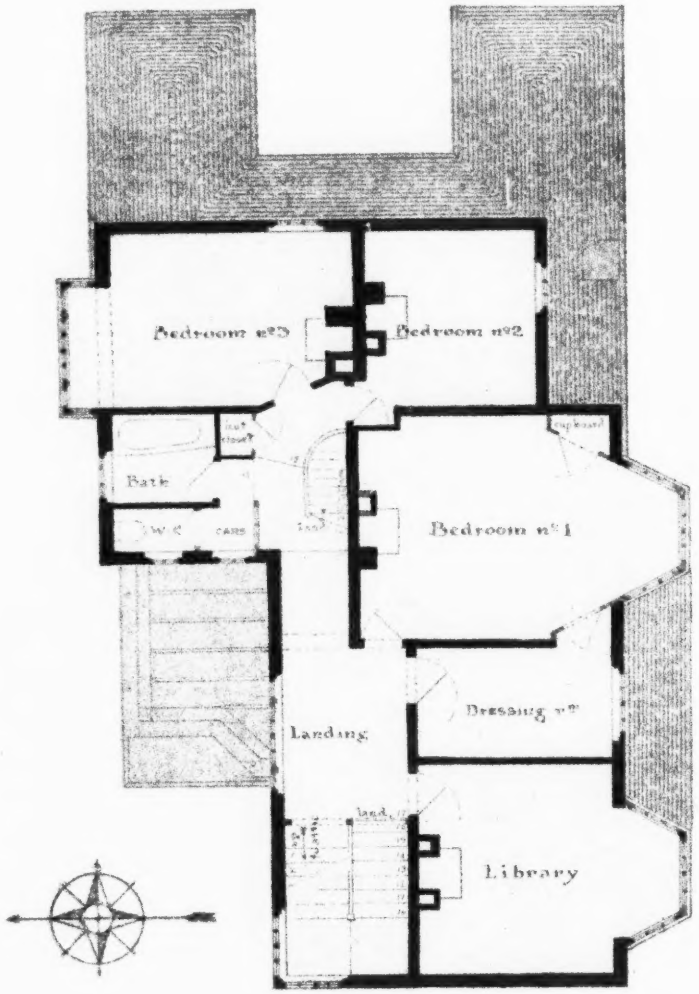
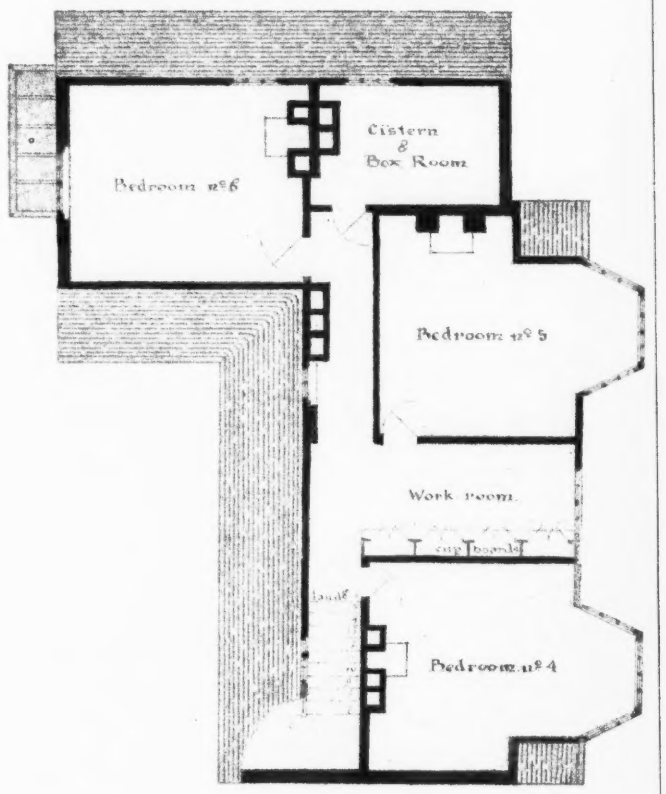




GROUND - FLOOR



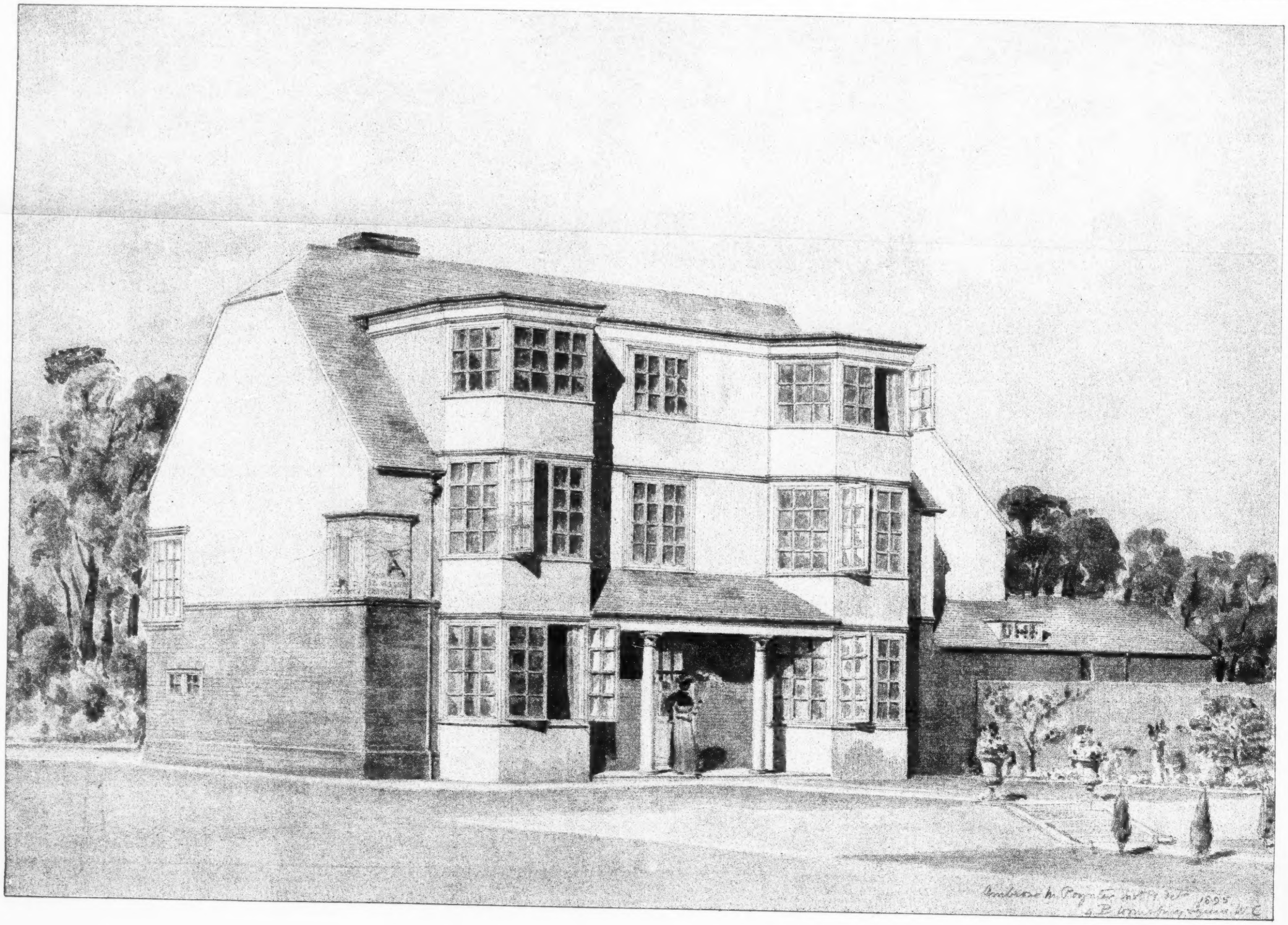
FIRST - FLOOR



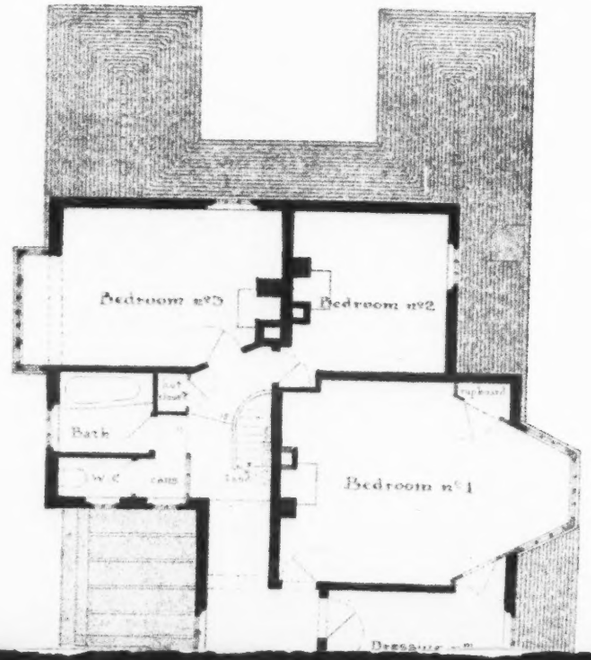
ATTIC - FLOOR

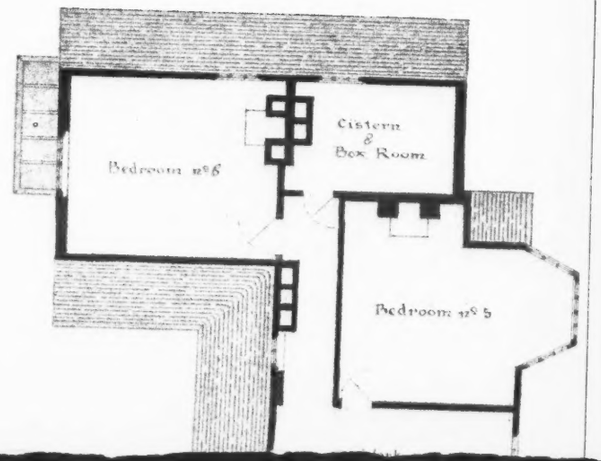
INK PHOTO SPRAGUE & Co 4 & 5 EAST HARDING STREET, FETTER LANE, E.C.

DESIGN FOR A SUBURBAN HOUSE.—By Mr. Ambrose M. Poynter.

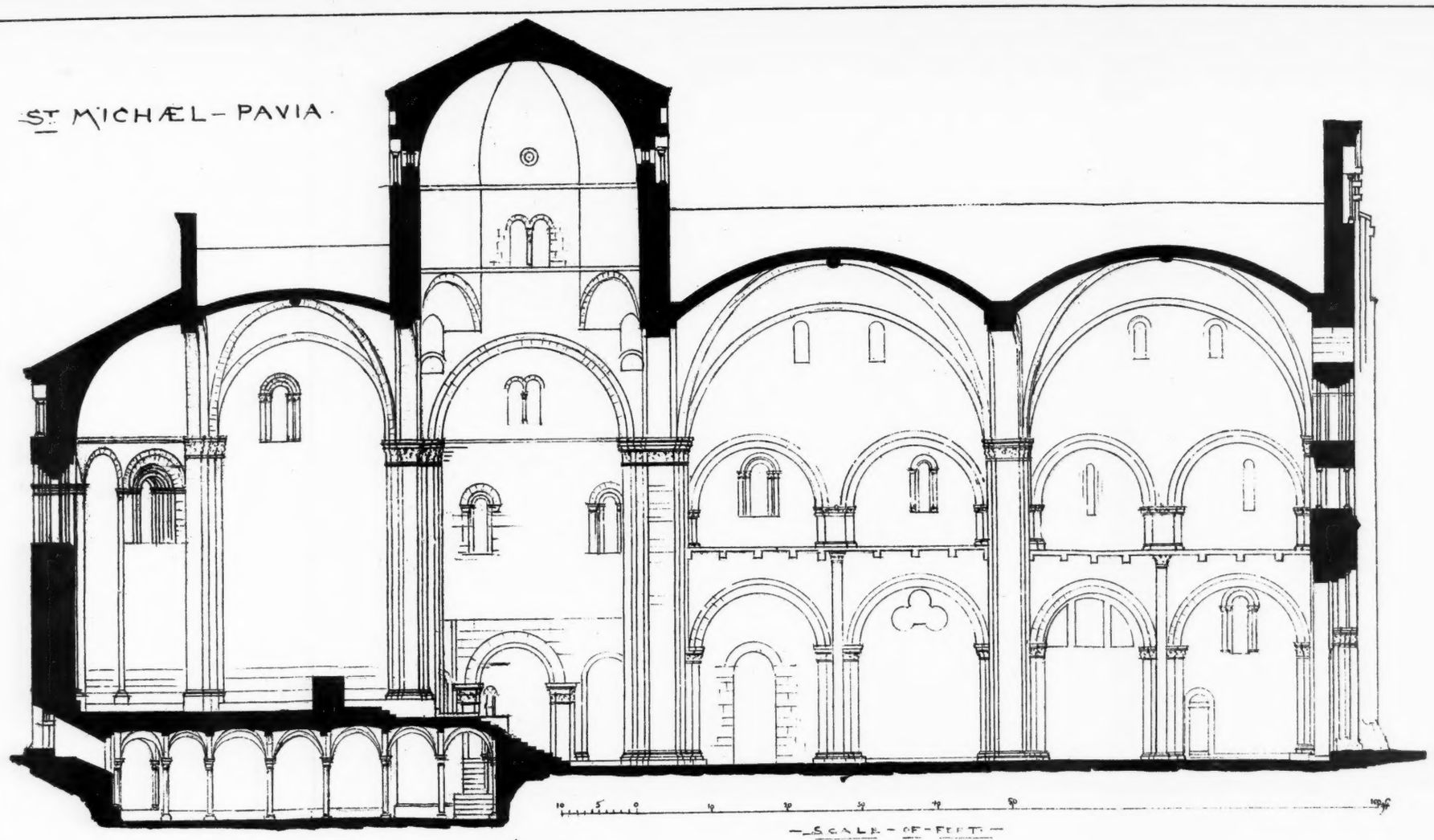


Knives &c
Coal
Larder
back door
Kitchen
Scullery
to cellar
Pantry
Dining room
Lavatory
Hall


Bedroom n°3
Bedroom n°2
Bath
W.C
Bedroom n° 1

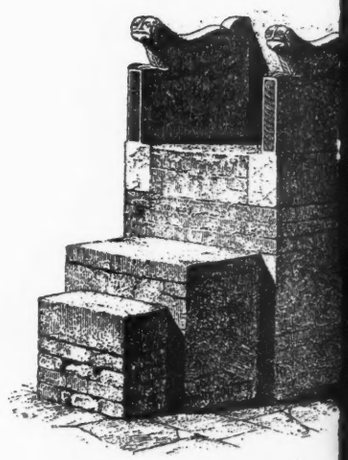

Cistern
&
Box Room
Bedroom n°6
Bedroom n° 5

ST MICHÆL - PAVIA.



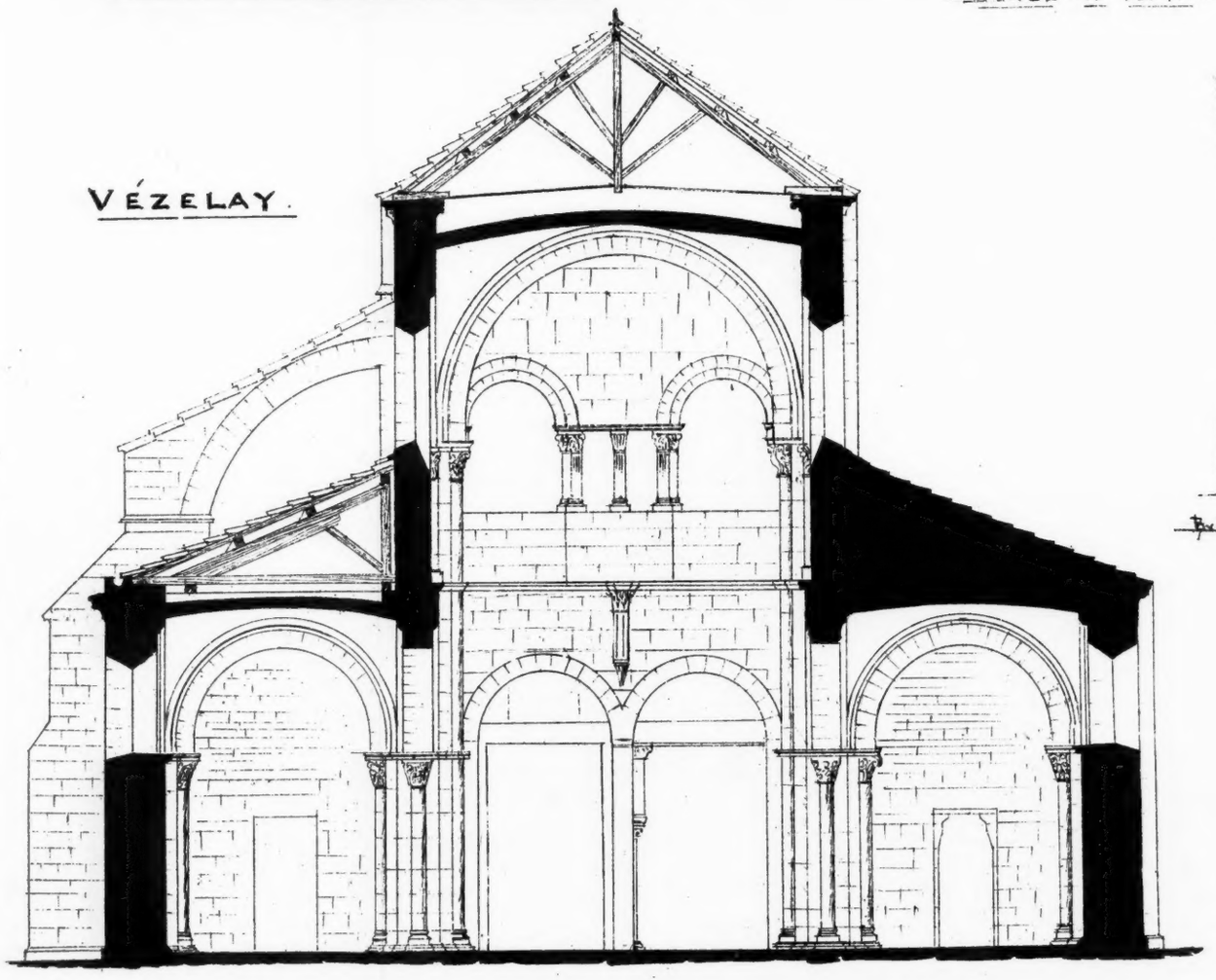
— SCALE OF FEET —

PANEL



ARCHIEPISCOPAL THRONE I
ST. AMBROGIO, MILAN.

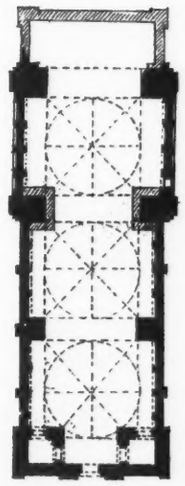
VÉZELAY.



As restored — CROSS-SECTION — Old state

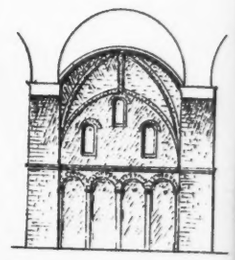
Scale of Feet 10 20 30 40 50 feet

Bairsworth Church



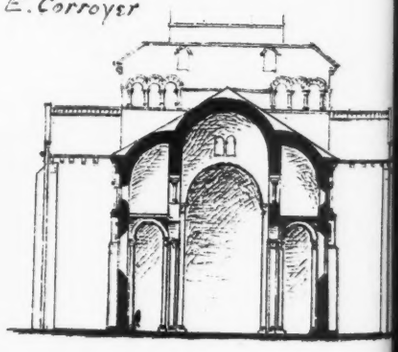
PLAN

End of XIIth Cenly.
From M. E. Corroyer



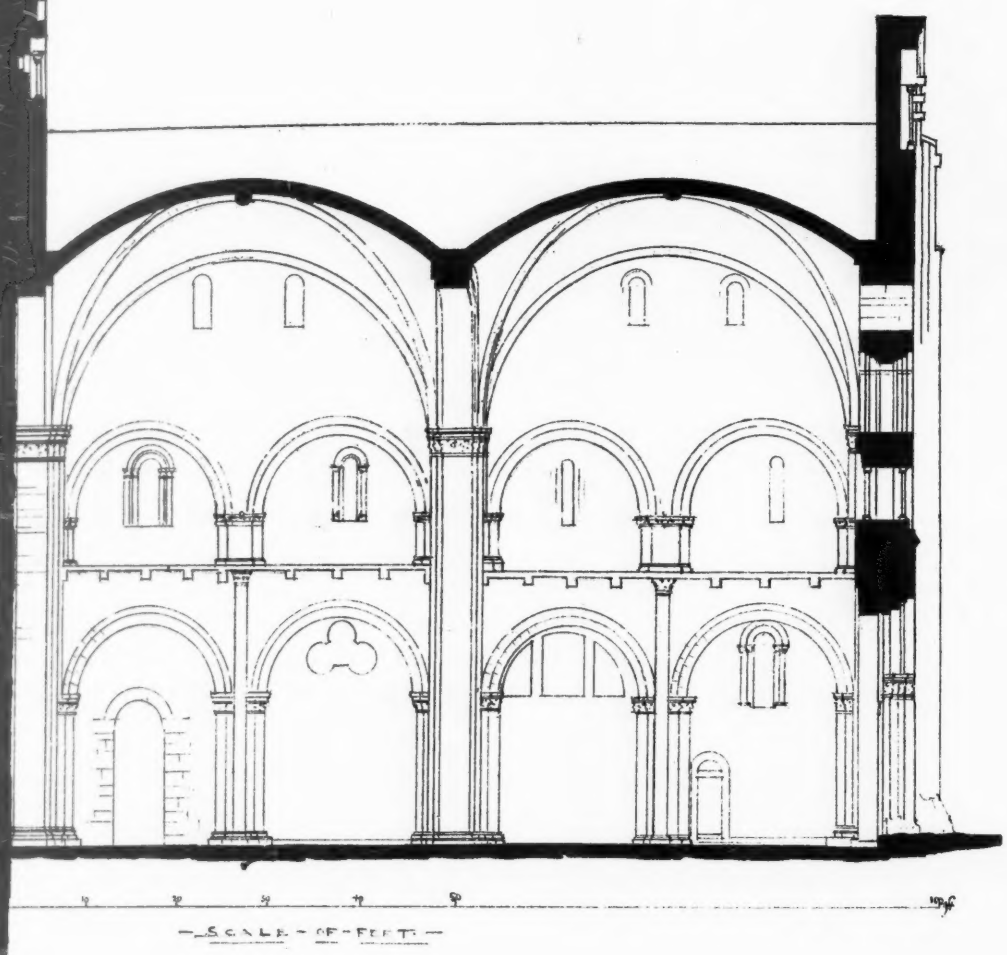
ST AVIT-SÉNIEUR

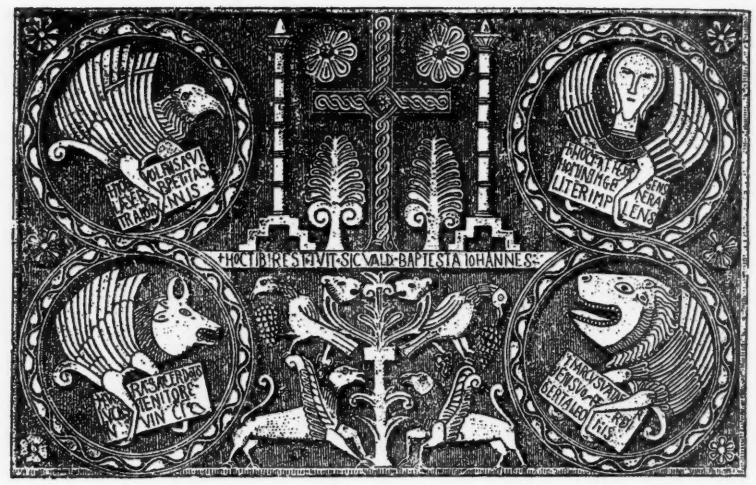
St. Paul Issoire.



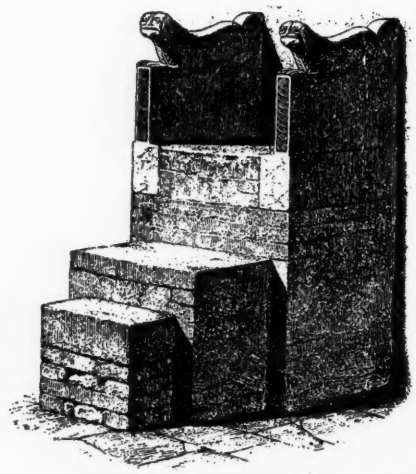
Cross section

"ROMANESQUE ARCHITECTURE": ILLUSTRATIONS TO PROFESSOR AITCHISON'S THIRD ROYAL ACADEMY LECTURE.



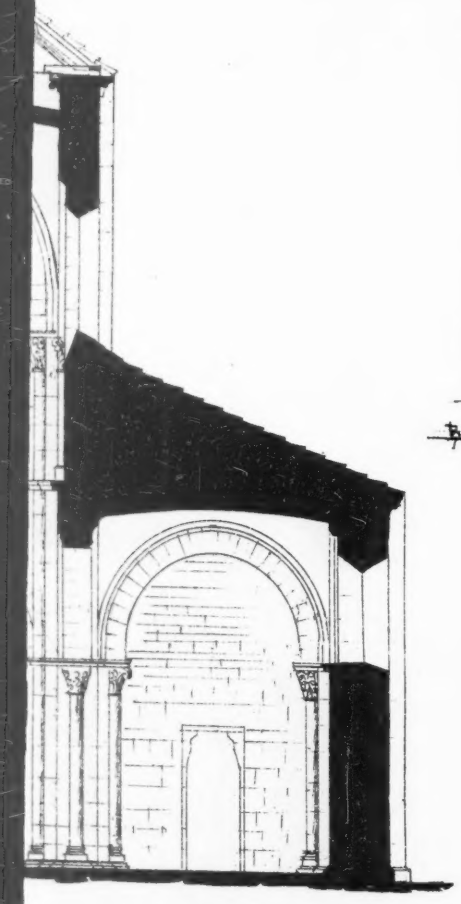


PANEL IN THE BAPTISTRY OF CIVITALE.
(Circa 762-776.)



ARCHIEPISCOPAL THRONE IN ST. AMBROGIO, MILAN.

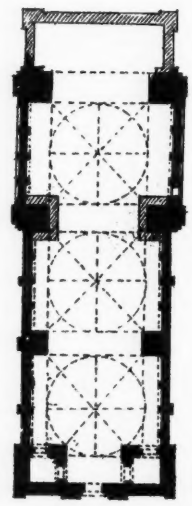
PILASTER AND PANEL IN SAN CLEMENTE, ROME. *(Circa 514-523.)*



Old state

Beverley Church

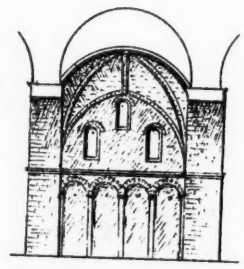
St. Paul Issoire.



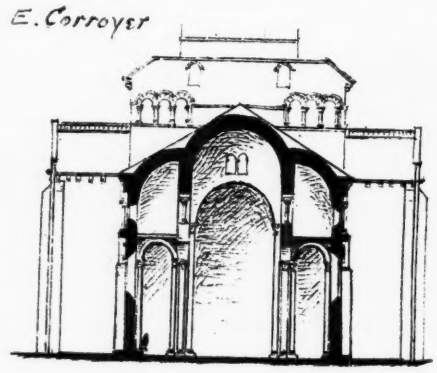
PLAN

End of XIIth Century.

From M. E. Corroyer



St. AVIT-SÉNIEUR -



Cross section

Woodwork of the Maristan of Kalaun. - 1279 - 1290 -

PHOTO-LITHO. SPRAGUE & Co 4 & 5 EAST HARDING STREET FETTER LANE E.C.